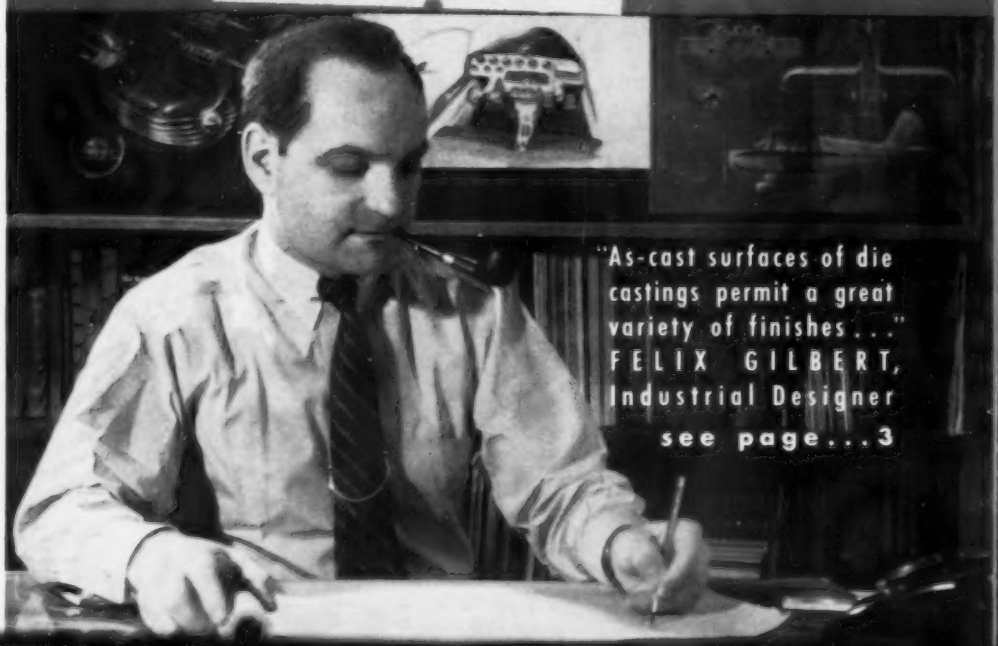
PMM

# Precision Metal Molding

INCLUDING DIE CASTINGS MAGAZINE

JULY
1955

EUGENE B POWERS OWNER
UNIVERSITY MICROFILMS
313 N FIRST ST
ANN ARBOR MICH
PIA91



"As-cast surfaces of die castings permit a great variety of finishes..."
FELIX GILBERT,
Industrial Designer
see page...3

devoted exclusively to:

DIE CASTINGS

INVESTMENT CASTINGS

PERMANENT MOLD CASTINGS

PLASTER MOLD CASTINGS

POWDER METALLURGY

SHELL MOLD CASTINGS

# Aluminum or Zinc Alloys

## that always help you get better quality castings and trouble-free production

## Aluminum ALLOYS

- All ingot produced for die casting, permanent mold and sand casting requirements have superior working characteristics and are free from impurities and gas.
- Composition is constantly checked during production to assure ingot meets your specifications.
- Orders are promptly processed and shipped with certificate of analysis.
- Shipments are palletized for fast, efficient handling.

## Zamak ZINC BASE DIE CASTING ALLOYS

- All ingot is quality controlled during production to insure uniform quality metal.
- All alloys to your specifications.
- All shipments are palletized and shipped with a certificate of analysis.
- Deliveries are promptly made to meet your production schedule.

**Aluminum Smelting & Refining Co., Inc.**

BEDFORD, OHIO
TELEPHONE: CLEVELAND MOntrose 2-3100

INDIANAPOLIS, INDIANA
215 Circle Tower • PHONE: MElrose 8-5541

DETROIT, MICHIGAN
P. O. BOX 4014 • PHONE: VErmont 7-9962

**Certified Alloys Co.**

BEDFORD, OHIO
TELEPHONE: CLEVELAND MOntrose 2-3100

INDIANAPOLIS, INDIANA
215 CIRCLE TOWER • PHONE: MElrose 8-5541

DETROIT, MICHIGAN
P. O. BOX 4014 • PHONE: VErmont 7-9962

LOS ANGELES PLANT
9323 BERMUDEZ ST., RIVERA, CALIF.
PHONE: OXford 9-9610

*For more information circle No. 6 on the Reader Service Card*

# DIE SET-UP

## *Easier! Faster! Safer!...*

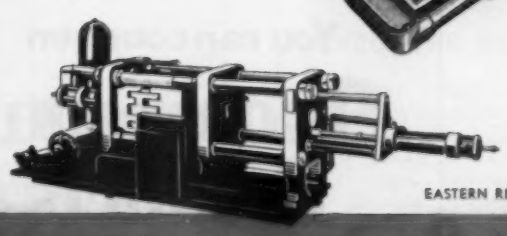
WITH

## CAST-MASTER

### DIE-CASTING MACHINES

Built-in Rack and Pinion permits use of a ratchet wrench to quickly move the complete die-locking assembly in place to accommodate various sizes of dies.

Die-Lock Valve can be shut off and by-passed, with Inching Valve assuring added safety when setting up die. This permits instantaneous, micromatic control.



Faster set-up time is just one of the many "bonus" features which make Cast-Master today's outstanding choice in die-casting machines. To get the complete "bonus" story, send for the Cast-Master catalog, containing illustrations and specifications on eight new models.

**SEND FOR CATALOG TODAY!**

EASTERN REPRESENTATIVE: Milton Harmon, 18 Rock Road, Milford, Connecticut

**CAST-MASTER *Inc.*** 2123 HAMILTON AVE. CLEVELAND 14, OHIO

*For more information circle No. 17 on the Reader Service Card*

# THOMPSON ENGINEERS LIGHT METAL CASTINGS

## FOR ALL INDUSTRY

*Versatility* today keynotes more and more the operations at Thompson Products Light Metals Division. Light, strong, durable metal castings are constantly being engineered, designed, developed and produced by Thompson's exacting engineers for a wide range of customer uses.

A background of over 50 years in research and manufacture of precision metal parts enables Thompson to offer aid to all forms of industry. Today it is producing light metal castings for such diversified products as aircraft and washing machines; buses and garbage disposers; tractors and outboard motors; automobiles and industrial engines.

Regardless of your product, if you use castings, Thompson's creative engineers will gladly show you where and how you can simplify your operations and save on costs with Thompson's Light Metal Castings.

Write or phone Light Metals Division, Thompson Products, Inc., 2269 Ashland Rd., Cleveland 3, Ohio.

AIRCRAFT
A carbon pile regulator —a high pressure aluminum die casting.

APPLIANCES
A garbage disposer housing—one of several permanent mold castings Thompson makes for garbage disposer units.

AIRCRAFT
An alternator housing used on jet aircraft engines.

APPLIANCES
Die cast motor end frames used on appliance and industrial electric motors.

*For a detailed description of the Thompson Light Metals Division operations, send for your free copy of "Creative Castings". "Steel Belted Pistons", detailing this Thompson development, is also available. Just write, on your company stationery, to Dept. PM-3, Light Metals Division, Thompson Products, Inc., 2269 Ashland Road, Cleveland 3, Ohio.*

**You can count on**

# Thompson Products

**LIGHT METALS DIVISION**

**2269 Ashland Road** **Cleveland 3, Ohio**



For more information circle No. 61 on the Reader Service Card

PMM

July 1955

Volume 13 Number 7

# Precision Metal Molding

DIE CASTINGS
INVESTMENT CASTINGS
PLASTER MOLD CASTINGS
PERMANENT MOLD CASTINGS
POWDER METALLURGY
SHELL MOLD CASTINGS

IRVING B. HEXTER
President

LESTER P. AURBACH
Executive Vice-President

EDWIN M. JOSEPH
Vice-President

STAFF

N. N. GOODMAN, JR.
General Manager

DAVID W. VEIT
Editor

PHILIP R. KALISCHER
Associate Editor

F. P. MIGNIN, JR.
Circulation Director

DISTRICT OFFICES

NEW YORK
LEE HAAS, Mgr.
ARTHUR L. GOEBEL
60 E. 42nd St.—Room 803
New York 17, New York
Murray Hill 7-3420

CLEVELAND
ROBERT SIMMONS
1240 Ontario St.
Cleveland 13, Ohio
SUperior 1-9622

CHICAGO
LLOYD WILLOUGHBY, Mgr.
KENNETH L. JONES
Suite 1613-1615
520 N. Michigan Ave.
Chicago 11, Illinois
WHitehall 3-1655-56-57

LOS ANGELES
ALAN CAZIER, Mgr.
Room 1003
3460 Wilshire Blvd.
Los Angeles 5, California
Dunkirk 9-9364

LONDON
JOHN A. LANKESTER
31 Palace St.
Westminster
London, S.W. 1, England

TOKYO, JAPAN
F. C. TAYLOR
American Trading Co. (Japan) Ltd.
No. 1 Shiba Park 7-Gochi
Minato-Ku, Tokyo

copyright 1955 by
The Industrial Publishing Group
Div. of Telenews Productions, Inc.
1240 Ontario St., Cleveland 13, Ohio

## FEATURE ARTICLES

31 **WHO USES DIE CASTINGS? 1. PHOTO EQUIPMENT.** More and more die castings go into cameras, enlargers, projectors, etc.

34 **HOW YOUR PRODUCT IS DESIGNED FOR SALES.** A product designer tells his method of designing a photo tripod.

37 **LONGER LIFE FOR SMALL MOTORS.** Better heat dissipation increases efficiency and durability of special-purpose motor.

38 **POWER TRANSMISSION AND BEARING ELEMENTS** are produced at low cost by powder metallurgy.

40 **CASTABILITY: ITS EFFECT ON ALLOY SELECTION** (Part Two). Proper choice of alloys for investment casting.

44 **THE PROBLEM OF THE DEEP-CORED CASTING . . . AND ITS SOLUTION.** Die design helps to produce an oversize casting.

## FINISHING SECTION

51 **GET THE MOST OUT OF YOUR ABRASIVE BELTS.** A specialist in coated abrasives answers some questions on finishing die castings.

56 **AUTOMATIC PLATING BOOSTS PRODUCTION ON DIE CAST REFRIGERATOR HARDWARE.** New installation steps up production 150 percent.

## REGULAR DEPARTMENTS

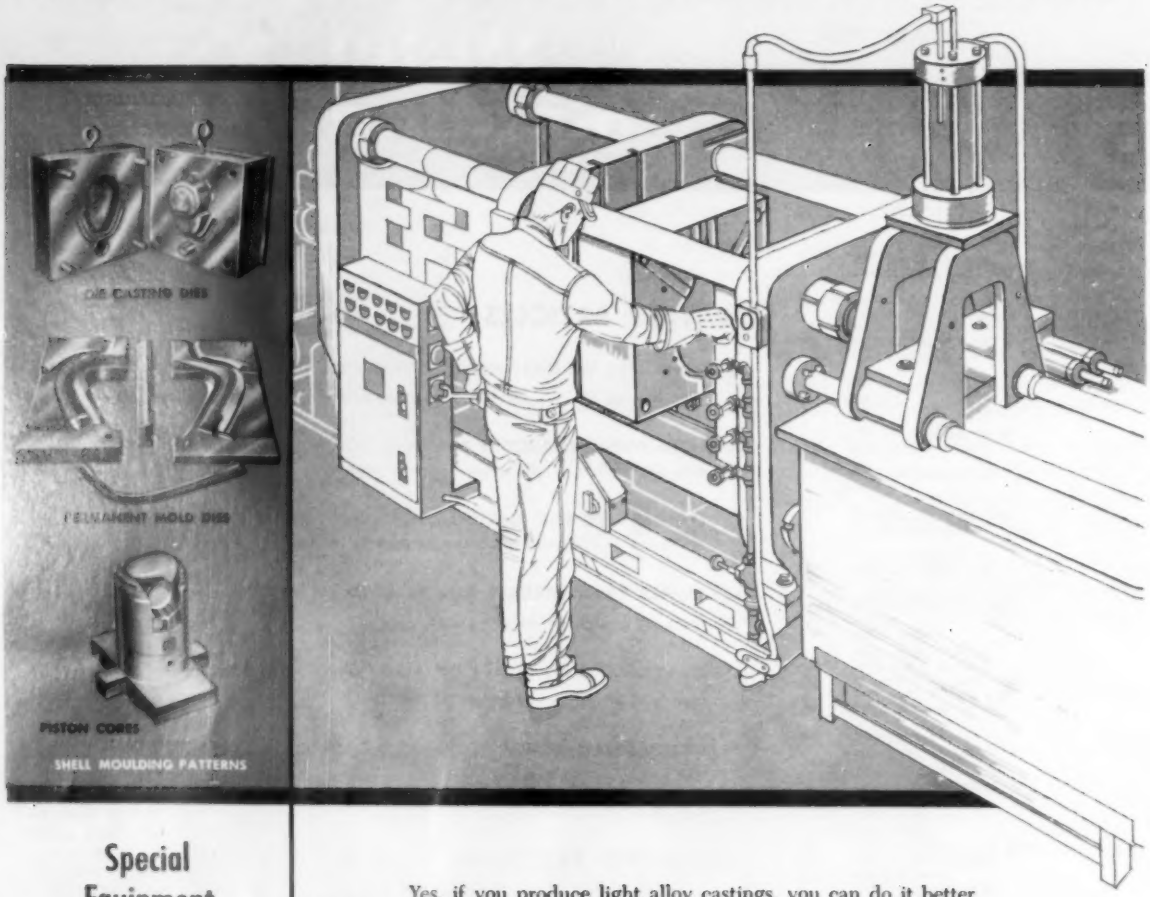
13 News About People
16 Data in Ads
22 Between the Lines
24 Patents
27 Casting About
60 Useful Literature
64 New Products
69 Opportunities
73 Industry News

Subscription rates: United States and possessions — $5.00 per year; $8.00 for 2 years; Canada — $6.00 per year; Foreign — $7.00 per year; Subscriptions to the United Kingdom — £1.10 per year, payable in Sterling to our London office. Extra copies: 1 to 10 — 50¢ each; 11 to 25 — 40¢ each; over 25 35¢ each; Canada — 50c each; Foreign — 60c each. All subscriptions subject to individual acceptance by the publisher.

Published monthly. Accepted as controlled circulation publication at St. Joseph, Mich.

Please return 3579 forms to 1240 Ontario St., Cleveland 13, Ohio.

# if you can do it with light alloys . . .
# you can do it BETTER with PMD dies!




## Special Equipment

Permanent Mold Operating Devices

D.C. Casting Units

Billet Molds

Coilers for Tubing

Trim Dies

**COMPLETE DESIGN AND ENGINEERING SERVICE AVAILABLE**

Yes, if you produce light alloy castings, you can do it better with PMD dies! Longer service life, minimum starting problems, lower overall tooling costs—these are plus advantages you get from PMD!

One of America's largest independent producers of dies, molds, special machines and molding devices, Permanent Mold Die Company offers every facility to do the job right! Complete design-engineering service . . . skilled, experienced personnel . . . plus the specialized tools and equipment to meet every requirement.

PMD dies and molds are *guaranteed* to perform to your specification! For the right solution to your tooling problems—call in a PMD specialist. Write or phone today!

PERMANENT MOLD DIE COMPANY, INC.
2273 W. Nine Mile Rd., Hazel Park, Mich. Phone: SLocum 7-8100

**WRITE TODAY FOR YOUR COPY OF THIS NEW PMD REFERENCE CATALOG!**

*For more information circle No. 53 on the Reader Service Card*

# Earmarks of Quality

## with MADISON-KIPP zinc and aluminum die castings

A MOST VITAL FACTOR in designing is to get the "quality look" at no cost increase or even at a saving.

In the Two Circuit Double Break Push Button Micro Hand Switch here illustrated, the first and lasting impression is high quality. The functional holes, bosses, ribs, unyielding strength, and inherent stability are plus factors.

Please clip this ad as a reminder to contact us when you have die casting requirements.

kipp

**MADISON-KIPP CORPORATION**
**213 WAUBESA STREET • MADISON 10, WIS., U.S.A.**

- Skilled in Die Casting Mechanics
- Experienced in Lubrication Engineering
- Originators of Really High Speed Air Tools

*For more information circle No. 42 on the Reader Service Card*

# New From Lindberg-Fisher

**For Permanent Mold and Sand Casting of Aluminum, Magnesium, Zinc and Lead.**

**A Lindberg-Fisher Electric Resistance Melting Furnace can mean lower cost per lb. of finished casting.**

These furnaces eliminate localized heating of metal, eliminate gas absorption, because there are no products of combustion present. Higher production results, due to less operator fatigue. Exhaust fumes and smoke are nonexistent and radiation loss is held to an absolute minimum by use of high quality insulation.

Longer crucible or pot service and low furnace maintenance are obtained with the patented long life, low voltage elements.

Can also be used as a holding furnace on die casting applications.

*Write for Bulletin No. 320*

LINDBERG FISHER **MELTING FURNACES**
*A Division of Lindberg Engineering Company*
2463 WEST HUBBARD STREET, CHICAGO 12, ILLINOIS

*For more information circle No. 40 on the Reader Service Card*



*Announcing*

# A NEW CASTING WAX

Petrolite **PC 44**

**PC 44 ADVANTAGES**

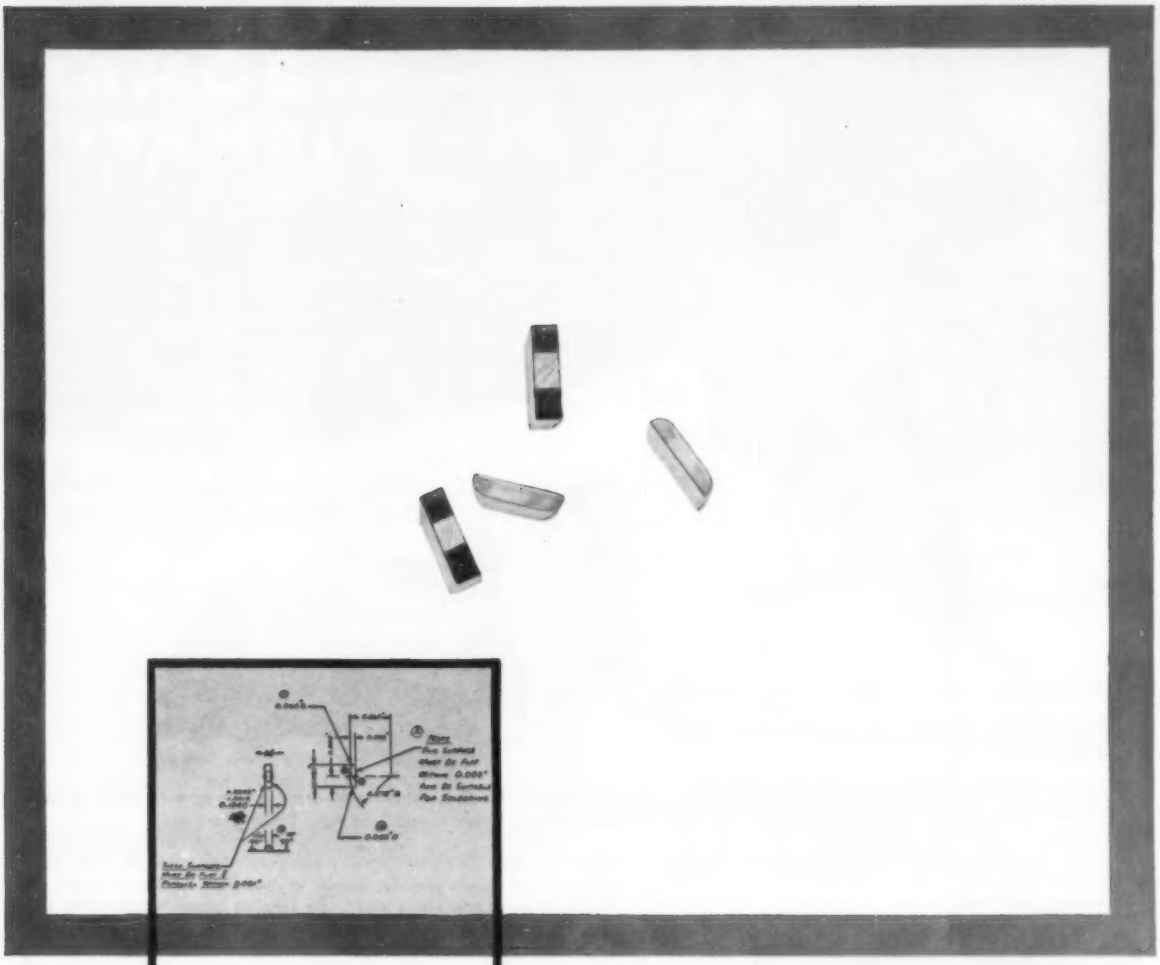
- **HARD AND TOUGH** — *not brittle*
- **FINISHED PRODUCT** — *no blending*
- **LOW SOLIDIFICATION** — *140-145°F*
- **LOW INJECTION TEMPERATURE** — *140-180°F*
- **LOW VISCOSITY** — *easily injected*
- **MINIMUM SHRINKAGE** — *insuring precision*
- **SUPERIOR MOLDING** — *no flow line defects*
- **LOW COST** — *prices on request*
- **AVAILABILITY** — *shipped directly from refinery*

While PC 44 is ready for use as produced, without blending, it is readily compatible with most other casting waxes. It can be blended with Petrolite PC 13 to give any desired injection temperature.

Petrolite PC 44 is available for immediate shipment in 100 pound cartons of 8 slabs each, directly from the Petrolite refinery at Kilgore, Texas. Samples available on request.

**PETROLITE CORPORATION**
WAX DIVISION
Chrysler Building, New York 17, N. Y.
P.O. Box 390, Kilgore, Texas

*For more information circle No. 54 on the Reader Service Card*





# accurate dimensions of ACCUMET PRECISION INVESTMENT CASTINGS mean improved uniformity . . . lower cost

A manufacturer of hearing aids, using magnets in the form of sand-cast bars, found grinding and cutoff costs excessive . . . dimensional control difficult . . . breakage high.

Crucible engineers suggested producing the magnets to close tolerances by *Accumet® Precision Investment Casting*, using a special patented Crucible Alnico grade. Results? Costly finishing operations were almost entirely eliminated, and magnetic properties improved. The manufacturer got a *better magnet at a lower cost.*

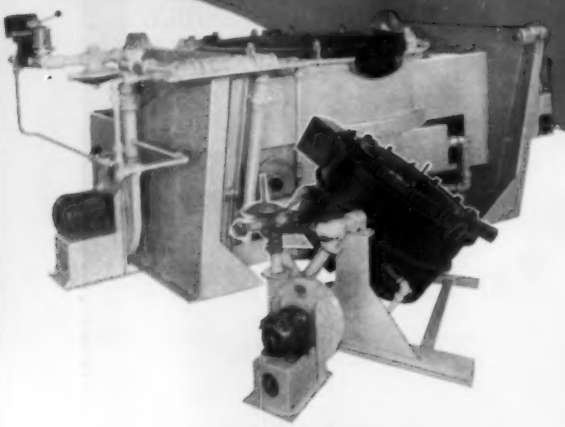
When you have a product requiring close tolerance, quality parts of any size, be sure to consider the advantages of Accumet Precision Castings. They are also available in stainless, alloy and cobalt-nickel base grades. Your nearby Crucible representative can show you how they cut production time . . . save you money. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 30, Pa.*

**CRUCIBLE** first name in special purpose steels

**Crucible Steel Company of America**

*For more information circle No. 31 on the Reader Service Card*

# Get Perfect Pours at Lower Costs WITH Faster STROMAN FURNACES



**Yes sir, you can bank on Stroman Foundry Equipment to deliver metal the way you want it, when you want it, everytime . . . for Stroman are the leaders in design of metal melting furnaces and equipment. For many years they have set the pace in the field, producing the finest furnaces that have effected tremendous economies for foundries, die caster, sand caster and permanent mold plants. They can do the same for you. Get full information . . . write for NEW Bulletin 900 today!**

## STROMAN TYPE "NL" FURNACES

**For Aluminum, Zinc, Lead, Kirksite and other Soft Metals.**

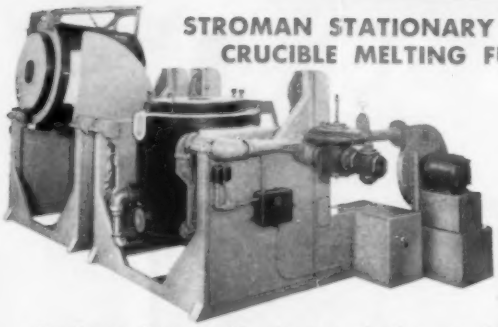
These furnaces have many uses and are particularly efficient when large pieces of metal or bulky scrap is to be remelted. The iron pots have a large diameter and a comparatively shallow bath. Available in choice of Hand Tilt or Hydraulic Tilt with Stationary Lip Pour.

## STROMAN LARGE SIZE REVERBERATORY FURNACES

**For melting unlimited capacities of Aluminum, Zinc or Brass.**

Excellent for Smelting, Extrusion Work, Die Casting, Permanent Mold and Foundry Melting. Built to meet your particular melting problem. Now in use in many of the largest manufacturers of castings.

## STROMAN STATIONARY LIP POUR CRUCIBLE MELTING FURNACE



**For Brass, Bronze, Aluminum and other non-ferrous metals. Capacities from No. 60 to No. 1000 Crucible.**

These furnaces with Stationary Lip Pour that assures a constant pouring arc meet specific needs in handling various metals for the foundry, permanent mold, die casting plants and rolling mill. It is ideal for use with monorail or dolly ladle for large quantities of metal. Eliminates spillage and waste.

## STROMAN CRUCIBLE STATIONARY MELTING FURNACES

For Brass, Bronze, Aluminum and other non-ferrous metals. Sturdy, efficient and featuring the Stroman Push-Back Cover these stationary furnaces are designed for peak production and greatest fuel economy. Oil or Gas Fire. Capacities from No. 20 to No. 400 crucible.

## STROMAN FOUNDRY EQUIPMENT

**• Oil Burners**

For ordinary or extremely high temperatures. A type built for every purpose.

**• Centrifugal Blowers**

Precision fabricated to deliver combustion air in any desired pressure or volume.

**• Oil Pumping Units**

Come complete, ready to hook into your heating system. Fool proof in operation.

**Write for NEW CATALOG 900**

just off the press!
All New Equipment. Do it now!

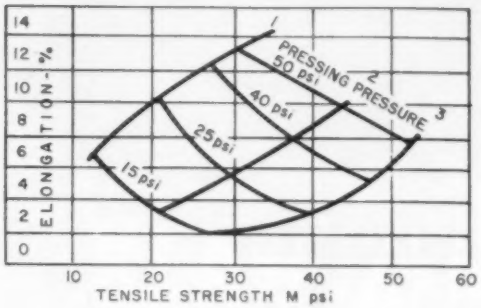
**STROMAN FURNACE & ENGINEERING CO**

DIVISION OF THE PETERSEN OVEN CO. • FRANKLIN PARK, ILL.

For more information circle No. 18 on the Reader Service Card

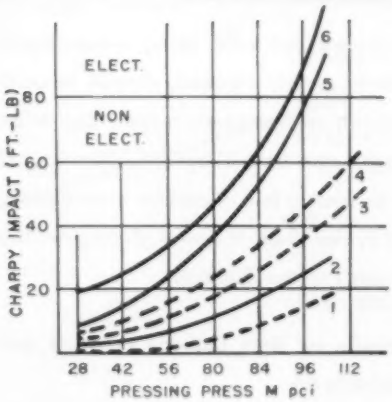
# FOR IMPACT STRENGTH SPECIFY HVA ELECTROLYTIC IRON POWDER

Superior tensile strength and elongation with small copper additions in single pressing.




Curve 1 — Straight iron
Curve 2 — Iron plus 3% copper
Curve 3 — Iron plus 7% copper

Double pressing gives higher tensile strength and elongation in combination with excellent impact strength.



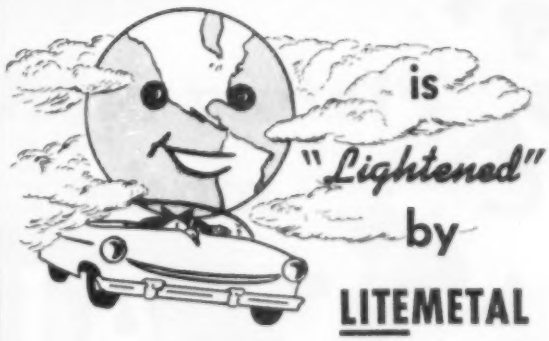

Curves 1 and 2 single pressed.
Curves 3 and 5 double pressed (first pressing 56,000 psi)
Curves 4 and 6 double pressed (first pressing 84,000 psi)

*For more detailed information write to*

**A. JOHNSON & COMPANY, INC.**
**61 BROADWAY • NEW YORK 6, N. Y.**

*For more information circle No. 35 on the Reader Service Card*

# The World On Wheels




## Automotive Parts Die Cast in ALUMINUM and MAGNESIUM

Not only do automotive parts die cast in aluminum or magnesium effect important weight savings in today's beautiful automobiles, but they materially aid the designer and engineer who create these vehicles which literally place us in a "World on Wheels".

Through the use of these new light metal alloys greater scope is offered for practical and economical production. Manufacturers have proof that die cast parts of aluminum and magnesium make possible much lower production costs due to their virtual elimination of machining and finishing operations. In the photograph are illustrated a few of the lightweight automotive die castings by LITEMETAL. They include a Fan Spacer, Transmission Pump Housing, Servo Pistons, Window Regulator Shaft, Speedometer Trim Housing and Distributor Base.

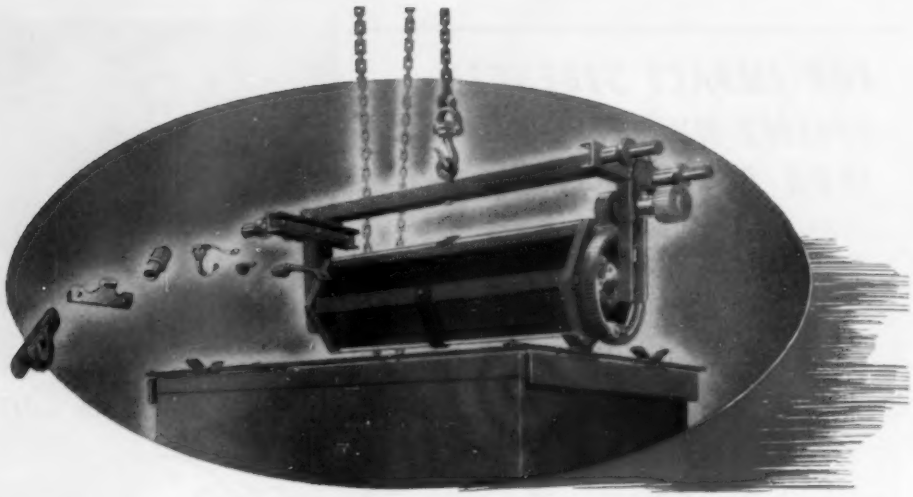
### Let's Talk It Over . . .

LITEMETAL DICAST, INC. is an organization of specialists — men thoroughly experienced in the casting and machining of magnesium and aluminum alloys. Our equipment includes big machines for big jobs — little machines for little jobs . . . the right sizes and types of the most modern die casting equipment for producing parts from the size of a button to large cable spools. Complete facilities for secondary operations are also available.

*Write today for literature and design information. Quick action on inquiries.*

**LITEMETAL DICAST, Inc.**
A DIVISION OF HAYES INDUSTRIES
1925 WILDWOOD AVE • JACKSON, MICHIGAN
PLANT AND EXECUTIVE OFFICES

*For more information circle No. 41 on the Reader Service Card*



# Plating on Aluminum made EASY with Alumon*

Hundreds of manufacturers throughout the United States are now using electroplated aluminum. The Alumon process is simple. The work is merely cleaned, dipped in acid, dipped in Alumon and is then ready for electroplating with copper, nickel, and other metals. The process is suitable for plating most wrought and cast alloys. . . The cost of using Alumon is low, being less than half a cent per square foot of surface area treated. The process can be fitted easily into regular plating cycles. Bulk or barrel plating readily done. Upon request we'll gladly send you the Alumon Process Bulletin.

**Write for literature on Alumon and check list of literature on sixty Enthone products and processes for better metal finishing.**

*TRADE-MARK REG. U. S. PAT. OFF. MANUFACTURED UNDER U. S. PATENT 2,142,564.

METAL FINISHING PROCESSES

ENTHONE
INCORPORATED

ELECTROPLATING CHEMICALS

442 ELM STREET
NEW HAVEN, CONNECTICUT

*For more information circle No. 24 on the Reader Service Card*

for Quality Production

AMERICAN ELECTROLYTIC

# 99.99+% SLAB ZINC

A reliable source for die casting requirements

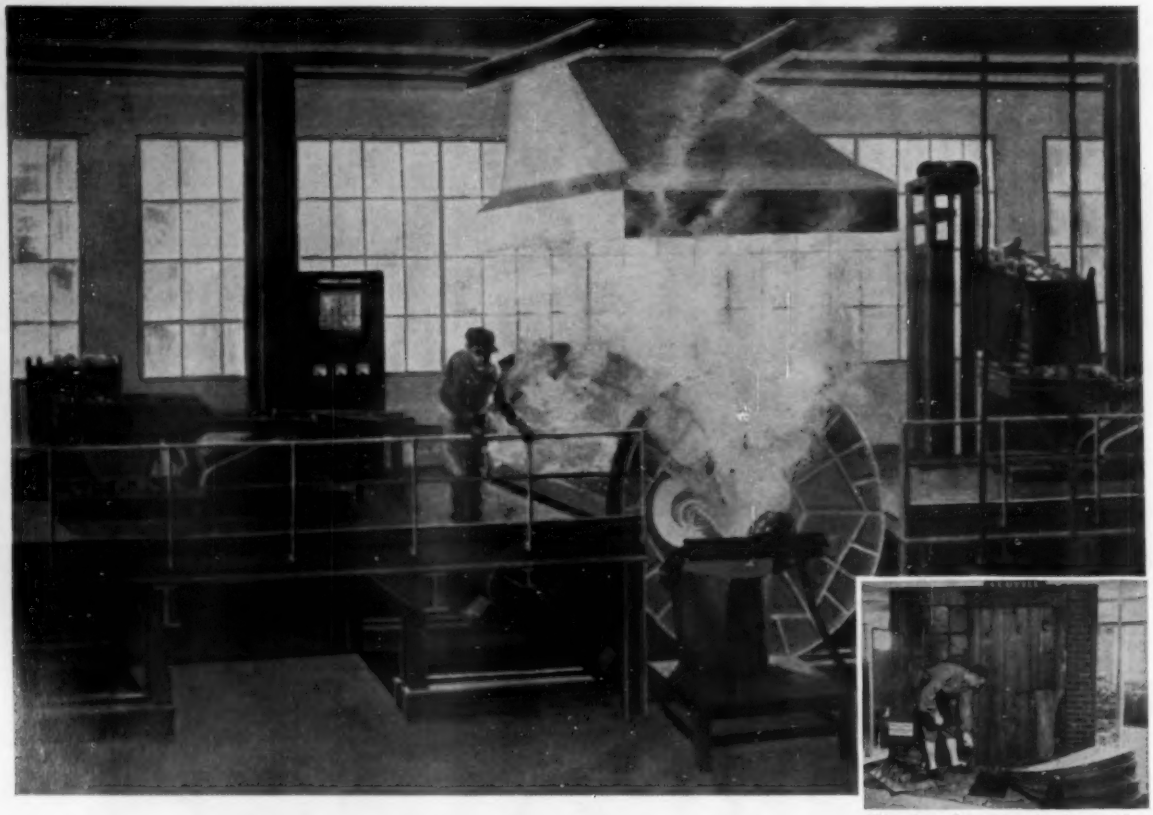
**AMERICAN ZINC SALES COMPANY**

Distributors for

**American Zinc, Lead & Smelting Company**

Columbus, Ohio • Chicago • St. Louis • New York

*For more information circle No. 7 on the Reader Service Card*





Skimming the pot prior to pouring into tiny 1 lb. capacity band-and-wedge molds.

# BRASS MELTING THROUGH 150 YEARS

According to tradition and available records, founders of the Scovill Mfg. Co. of Waterbury, Conn. were first in the New World to cast brass bars commercially for subsequent cold rolling, at the old Abel Porter casting shop in Waterbury, Conn.

From this modest beginning has grown the huge Scovill Works employing thousands of employees and producing enormous quantities of cold-rolled brass. One of the initial steps in the process is the melting of brass in three of the largest and most powerful electric melting furnaces ever made, one of which is shown in the picture above.

In the early 1800's the man-hour rate of production with charcoal pit fires was from 5 to 10 lbs. In the early 1920's when AJAX INDUCTION FURNACES were installed, the man-hour rate was 800 lbs. Since 1949 when the latest type AJAX furnaces were installed man-hour production has increased five fold, and is now 4,000 lbs.

These modern 1000 KW AJAX Furnaces have a holding capacity of 20,000 lbs. with an hourly melting rate of 5 to 5½ tons.

Photos at right show a unique demonstration staged by Scovill at the Hotel Statler in Hartford of America's first practical brass casting method. Here an operator in authentic brass caster's clothes of the period illustrated the casting of metal melted by the old bellows-blown pit fire used in the early 1800's. The tools were loaned by the Mattatuck Historical Society of Waterbury.

Pouring from pot into molds.

Opening molds after pouring metal into them.

AJAX

TAMA-WYATT

**AJAX ENGINEERING CORP., TRENTON 7, N. J.**

## INDUCTION MELTING FURNACE

AJAX ELECTRO METALLURGICAL CORP., and Associated Companies
AJAX ELECTROTHERMIC CORP., Ajax Northrup High Frequency Induction Furnaces
AJAX ELECTRIC CO., The Ajax Hultgren Electric Salt Bath Furnace
AJAX ELECTRIC FURNACE CORP., Ajax Wyatt Induction Furnaces for Melting

*For more information circle No. 4 on the Reader Service Card*

## NAMES IN THE NEWS

**Lee R. Herring** has been appointed as eastern sales representative for *Dickey Industries.*

**Elmer A. Lord** has taken over the sale of metal cleaners in Northern Ohio, Western Pennsylvania and West Virginia for *Cowles Chemical Company.*

*The International Minerals & Metals Corporation* has announced the appointment of **Henry L. Newmark** as the purchasing agent on the West Coast. He succeeds **Hans L. Green** who has retired from active business.

**H. Fred Baerwald** has been elected to the board of directors of *International Minerals & Metals Corporation.*

*Acme Aluminum Foundry Company* announced the appointment of **W. H. Osborne** as executive vice-president and **C. L. Sidinger** as vice-president in charge of manufacturing and engineering.

**Richard W. KixMiller** has been elected vice-president in charge of the *Chemical Division of Celanese Corporation of America.*

*Behr-Manning Corporation* has anounced the appointment of **Thomas Trowbridge** as general sales manager, **William J. Bennett,** sales manager for the company's eastern region, and **Victor F. Perreault** as industrial trades manager.

*Dixon Sintaloy, Inc.* announced the appointment of **L. B. Burnham** and **W. G. Fieneman** as their New England sales agents.

*Continued on page 15*


IT MAKES ALL THE DIFFERENCE IN THE WORLD

EpCo VACUUM CASTING

A New Technique for Increased QUALITY CONTROL

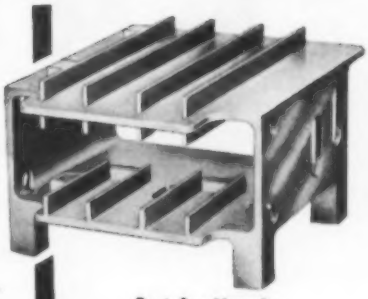
**An EPCO development, Vacuum Investment Casting can give your parts and assemblies qualities no other casting process can match.**

***It is now being used on aluminum, bronze and steel and imparts these qualities.***

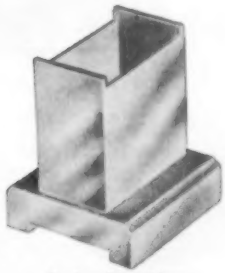
1. **Improves physical properties.**
2. **Improves surface finish.**
3. **Produces pressure tightness comparable to bar stock and forgings in aluminum and copper-base alloys.**
4. **Permits greater use of poor castable materials such as magnetic iron, pure copper, invar and radar plumbing materials such as aluminum 2S and 61S which are used for their better weldability.**
5. **Permits design of sharper corners, thinner sections than previously possible even with centrifugal casting.**

**In EPCO's new Vacuum Casting process may lie opportunities for further improving parts now cast, and equally important for casting parts and assemblies never before considered possible.**

**Investigate the savings in production costs and improvement in quality and design by getting an EPCO quotation before machining or assembling your intricate parts.**



**Part for Aircraft**
Aluminum 356-T6



**Radar Plumbing**
Aluminum 61-S

**Solenoid Housing**
Magnetic Iron

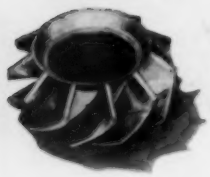
*Specify EPCO for your assurance of better quality.*

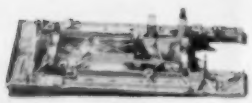
EpCo ENGINEERED PRECISION CASTING CO.

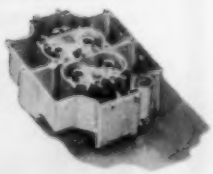
HIGHWAY #79, MORGANVILLE, NEW JERSEY

*For more information circle No. 23 on the Reader Service Card*

# *Your Best Buy in* DIE CASTINGS *is from* PRECISION!







**BEST IN DESIGN** . . because Precision's engineers have consistently paced the die casting industry in new and better ways to design efficiency in die castings.

**BEST IN PERFORMANCE** . . because Precision's rigid production and metal alloy controls assure our customers of top consistent quality in their die castings.

**FOR DEPENDABILITY** . . because Precision's extensive experience in die castings for over 46 years has now made Precision the world's largest independent die caster.

YOU CAN DEPEND ON A CONSTANT SUPPLY OF THE BEST DIE CASTINGS FROM PRECISION'S 9 COMPLETE PLANTS

**PRECISION CASTINGS CO., Inc.**
212 Walnut St., Fayetteville, N. Y.
Syracuse, N. Y. · Cleveland, O. · Chicago, Ill.
Kalamazoo, Mich. · Cortland, N. Y.
British Affiliation — Wolverhampton Die Casting Co., Wolverhampton, England

*For more information circle No. 55 on the Reader Service Card*

NAMES IN THE NEWS
continued from page 13

**William L. Morris** has been appointed a sales representative for *A. Milne & Company.*

**Steve Jerome** has been appointed general manager of the *Wagner Brothers Equipment Company.*

**Eugene H. Kinelski** has joined the *Development & Research Division of The International Nickel Company, Inc.* as a research metallurgist in the welding section of the research laboratory.

The appointment of **Frank W. Glaser** as vice president and director of the *Alloy Precision Castings Company* was recently announced.

**B. T. DuPont** has been appointed general manager and **C. E. Hanson** sales manager of the *Plastic Metals Division* of the *National-U. S. Radiator Corp.*

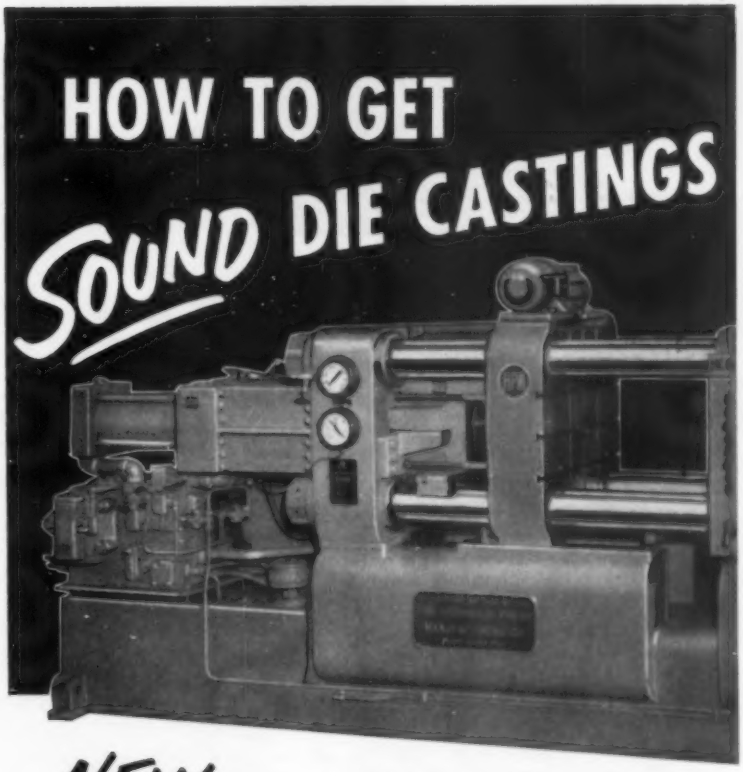
The appointment of **Leo J. McPharlin** as purchasing agent was announced by *Chrysler Corporation's Automotive Body Division.*

The **Hargrove-Green Company** has been appointed to represent the *Gries Reproducer Corp.* in Southern California.

**Ernest C. Kron,** formerly steel metallurgist for the *Doehler-Jarvis Division* of the *National Lead Company,* has been promoted to division metallurgist.

**Henry R. Merrill** has been appointed general sales manager of the *Behr-Manning Division of Norton Company.*

E. C. Kron H. R. Merrill

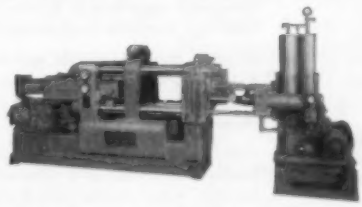




NEW H-P-M Mechanical Clamp Assures Positive Die Locking

Here's why H-P-M's new die casting machine makes better castings: new positive clamping action is achieved by sliding wedges driven by knuckle-joint linkage which preloads the press frame and backs up the platen. The results . . . a minimum of flash . . . sound castings.

In this new H-P-M clamp mechanism there are no toggle pins under heavy shear load . . . no single line contacts . . . and no extremely high stressed members that normally result in high maintenance cost and down time.

These are just a few of the 40 new and improved features of the new H-P-M die casting machine. Write for Bulletin 5400, a completely illustrated story on this H-P-M line of profit makers.



THE HYDRAULIC PRESS MANUFACTURING COMPANY
1094 MARION ROAD

HPM

For more information circle No. 32 on the Reader Service Card

# DATA OFFERED IN THIS MONTH'S ADS

*to get any of the free materials described here, circle the appropriate number on the reader service cards bound into this issue*

**3.** DRY FILM LUBRICATION can make major production economies possible. Bulletin No. 426-X10 and reprint DC, both from Acheson Colloids Co., describe materials of this type, their uses and properties.

**8.** THE CHEMISTRY, METALLURGY and mechanical properties of Apex aluminum alloy Z-39 are given in a data packed booklet from Apex Smelting Co.

**9.** SPECIAL RINGS FOR DIE casting machines are described in detail and available stock sizes given in literature from Auto-Diesel Piston Ring Co.

**12.** PRECISION DIE CASTING machines that are said to be low in both first cost and operating costs are completely described and all physical and operational data given in a new catalogue from American Die Casting Machinery Co.

**16.** SPECIAL ALLOY INGOTS for the investment casting industry are described and the chemistry, metallurgy and mechanical as-cast properties given in the latest MasterMet Alloy Bulletin from Cannon-Muskegon.

**17.** DIE CASTING MACHINES especially designed for fast change-over and high speed cycling operation are described in a catalog from Cast-Master, Inc.

**19.** MACHINE DESIGN details, specifications and production records of the Cleveland model 400 die casting machine are contained in Cleveland Automatic Machine Co.'s bulletin 400.

**22.** DATA FILE on ejector pins and related die components for molding and casting dies is available from Detroit Mold Engineering Co.

**24.** PLATED ALUMINUM is possible and economical with the Alumon process, described in detail in a bulletin from Enthone, Inc.

**27.** METAL WORKING LUBRICANTS, particularly those for forging and die casting, are described in pamphlets from Fiske Brothers Refining Co.

**28.** LOW COST DIE CAST fasteners are described and prices given in bulletins that are available from Gries Reproducer Co. Samples of die cast fasteners will be included.

**29.** THE HENNING MESSENGER, the house organ of Henning Bros. & Smith, Inc., gives information on metals and alloys, new applications of die castings and information about the company.

**31.** APPLICATIONS OF DIE CASTINGS are described and some design tips given in the Hoover Co.'s booklet, "Hoover Die Castings."

**34.** COST CUTTING with investment castings is outlined in the new booklet "Cast to Outlast" published by International Nickel Co.

**35.** THE PROPERTIES, USES and advantages of HVA electrolytic iron powder are given in literature that is available from A. Johnson & Co.

**36.** POWER PRESSES for trimming and other metal stamping and forming operations are fully described in Specification Bulletin 1955 from Johnson Machine and Press Corp.

**38.** TILTING ARC MELTING furnaces with a capacity of 15 pounds of steel and requiring only 12 KW are described in a bulletin on the type PT Detroit Electric Furnace issued by Kuhlman Electric Co.

**39.** HORIZONTAL AND VERTICAL die casting machines are completely described, their dimensions, capacities, production rates, etc. given in specification sheets from the Kux Machine Co.

**40.** LOWER COST MELTING with Lindberg-Fisher electric resistance heated furnaces is described in Bulletin No. 320 from Lindberg Engineering Co.

**41.** DESIGN INFORMATION and hints to simplify design of light metal die castings are given in a booklet published by Litemetal Dicast, Inc.

**48.** COSTS CAN BE CUT by using powder metallurgy as a fabricating method. A new booklet from National Molded Products Co. tells how. Included is a listing of stock sizes of bushings and bearings.

**51.** PRODUCTION PROBLEMS involving small parts and short runs can often be solved by using plaster mold castings, as discussed in a brochure from Ohio Precision Castings, Inc.

**53.** REFERENCE CATALOG on dies and molds for die casting and permanent mold casting has been issued recently by Permanent Mold Die Co., Inc.

**56.** MORE USABLE METAL from the zinc pot of die casting machines is possible in the new furnace design described in a brochure from the Reed-Prentice Corp. The brochure also fully describes that company's line of die casting machines using these zinc pots.

**59.** MELTING FURNACES of all types for both ferrous and non-ferrous metals are described in catalog 900 just issued by the Stroman Furnace & Engineering Co.

**60.** SPECIAL SILICAS for the investment casting industry are now available. The Tamms Industries, Inc. has price lists and information on these materials.

**61.** VERSATILITY IN DIE CASTING is the keynote to the production ability of Thompson Products, Light Metal Div. whose descriptive manual, "Creative Castings," tells about many unique jobs.

**63.** BARREL FINISHING using the Abbott method is the subject of literature offered by the Abbott Ball Co.

**64.** FINISHING ALUMINUM can be simple and economical with Iridite 14-2, complete details of which can be secured from Allied Research Products, Inc.

**65.** FINISHING FACTS & FIGURES that tell why finishing costs can be cut and how they can be cut are in the new 52 page catalog that has been issued by Almco Supersheen.

**66.** BARREL FINISHING 25 percent faster with Grav-I-Flo Corp. equipment and materials is the subject of descriptive literature now available.

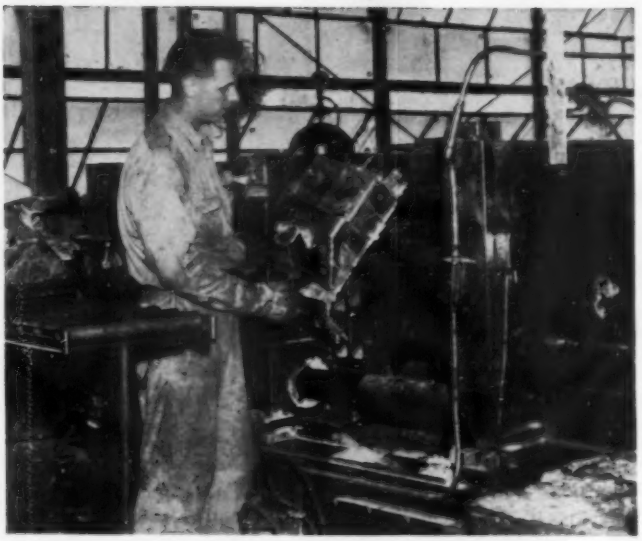
**67.** FIRMLY ANCHORED threaded fasteners are assured in soft metals when Tap-Lok inserts are used. The Groov-Pin Corp. has a descriptive folder on the application of these inserts.

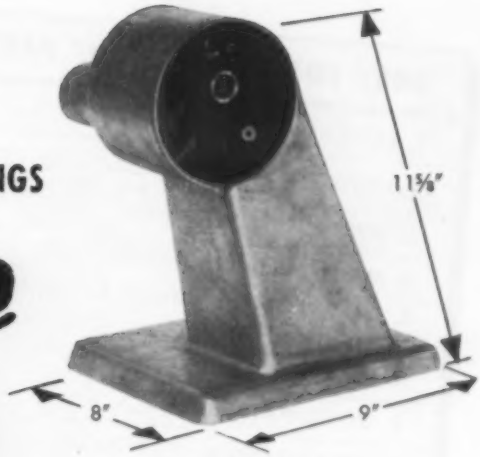
**68.** SUPER-FINISHES from barrel finishing equipment are possible with Honite methods and supplies. Minnesota Mining & Mfg. Co. has an engineering report on this method and on the finishing media.

PEMCO

PRODUCES ALUMINUM DIE CASTINGS

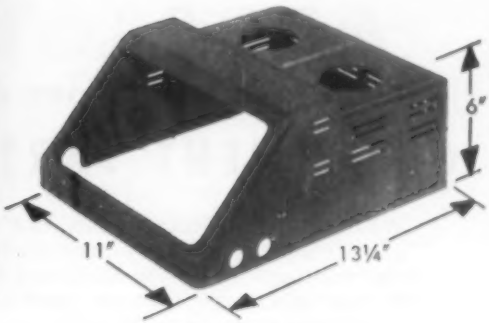
# king size






**8¼ LB. SHOT**

Roll drive housing for electric ironer. Produced for Bendix Home Appliance Co., South Bend, Ind. Finished casting weight is 6.9 lbs.




**4¼ LB. SHOT**

Tape recorder housing cast for Permaflux Corp., Chicago, Ill. Photo at left shows operator removing the as-cast housing from the Cleveland Model 400 Die Casting Machine. Finished casting weight is 3 lbs.

## WITH CLEVELAND MODEL 400 DIE CASTING MACHINES

The two castings shown above are typical of the top quality output of Product Engineering and Manufacturing Corp., Bridgman, Michigan. And like many other leading die casters, the mainstay of PEMCO's casting production are Cleveland Model 400 Die Casting Machines.

With the Cleveland Model 400's tremendous die locking pressure, high-speed shot injection, and rapid die closing and opening action, PEMCO receives a continuous flow of dense, hardware finish castings at a highly profitable rate of production.

Let Cleveland's time-proved leadership in die casting machine design give your die casting department or shop the same dependable performance—on zinc and aluminum castings—large and small—simple and complex. Ask a Cleveland sales engineer to show you the many Cleveland Model 400 advantages. For information on machine design details and specifications, write for Bulletin 400.

**Remember:** *Clevelands Cut Costs*

**THE CLEVELAND AUTOMATIC MACHINE COMPANY**

**4952 Beech Street**
**Cincinnati 12, Ohio**

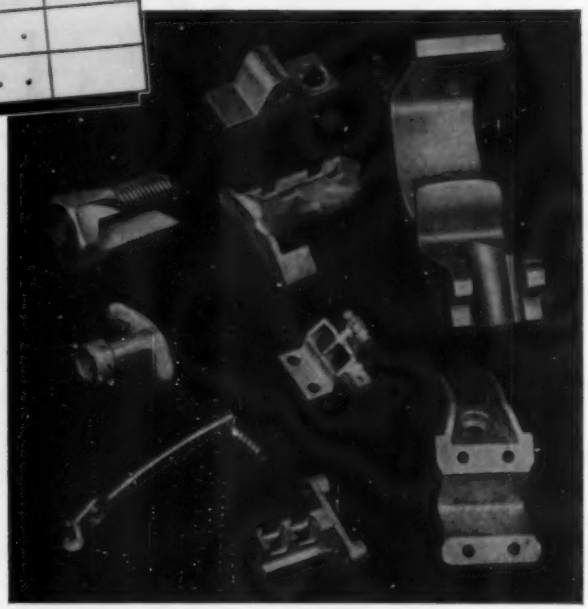
SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • S. ORANGE

**Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines**

*For more information circle No. 19 on the Reader Service Card*

| DOES YOUR COMPONENT PART REQUIRE: | |
|---|---|
| 1. COST REDUCTION | |
| 2. HI-STRENGTH | |
| 3. CORROSION RESISTANCE | |
| 4. MANY MACHINING OPERATIONS | |
| 5. THAT IT BE MADE FROM BRASS, BRONZE, OR ALUMINUM | |
| 6. IMPROVED APPEARANCE FOR SALES APPEAL | |
| 7. INTERLOCKING PARTS | |
| 8. HIGH-STRENGTH BEARING QUALITIES | |

**If you can check one item on this list, send us your blueprints for estimating . . .**



*We'll prove to you*

# ALCALOY

**can save you money on**

## COMPONENT PARTS

We have a new permanent mold casting process and an exclusive bronze alloy that team up to give you a big cost reduction advantage in your products. Keep these facts in mind when you're designing and planning production.

Alcaloy castings are uniformly close-grained, clean, sound and free from cavities and surface flaws. All dimensional tolerances are held within specifications. This means low machining costs, less scrap, less shop equipment. First costs of castings often are lower than other types.

Our special bronze alloy is non-sparking, non-magnetic, corrosion-resistant and light gold bronze in color. It remains free from tarnish and pitting. Some grades have the strength of steel and hardness of C 35-40. This alloy is valuable in safety tools, machine parts, chains, fittings, utensils and many other products.

We are increasing our facilities to insure prompt delivery on component parts. Send us blueprints or return the coupon below for the complete, money-saving Alcaloy story.

**ALCALOY, INC.**
P. O. BOX 503 TRENTON, NEW JERSEY
*ASSOCIATED WITH DICKEY INDUSTRIES*

### * ACCURATE INSPECTION INSURES UNIFORM QUALITY

**Every phase of Alcaloy production is supervised by experienced metallurgists. We are licensed by U. S. Atomic Energy Commission to use Cobalt 60 in testing castings for internal flaws. You can depend on Alcaloy quality.**

Send information on Alcaloy Casting Process ☐ A
Send new Alcaloy catalog ☐

Name _____ Title _____

Firm _____

Address _____

City _____ Zone _____ State _____

*For more information circle No. 11 on the Reader Service Card*

DATA IN ADS
continued from page 16

**70.** FINISHING COMPOUNDS for use with barrel finishing machines are described and their properties given in detail in a booklet prepared by Oakite Products, Inc.

**71.** HYDRO-FINISHING, a process developed by the Pangborn Corp. is described in detail in bulletin 1403, just issued.

**72.** LEAD SCREW TAPPING with a new type of unit that gives gauge perfect parts every time is described in a brochure from Procunier Safety Chuck Co.

**73.** COPPER, NICKEL & CHROMIUM electro-deposited coatings through the use of Unichrome methods and materials are reported in bulletins from United Chromium, Inc.

**74.** THE FACILITIES to give their customers a complete job, from print to casting, are described in a brochure from Paramount Die Casting Co.

**77.** FINISHING EQUIPMENT and machines, including wiping machines, masks, mask washers, painting machines, etc. are fully described and illustrated in circulars from Finish Engineering Co., Inc.

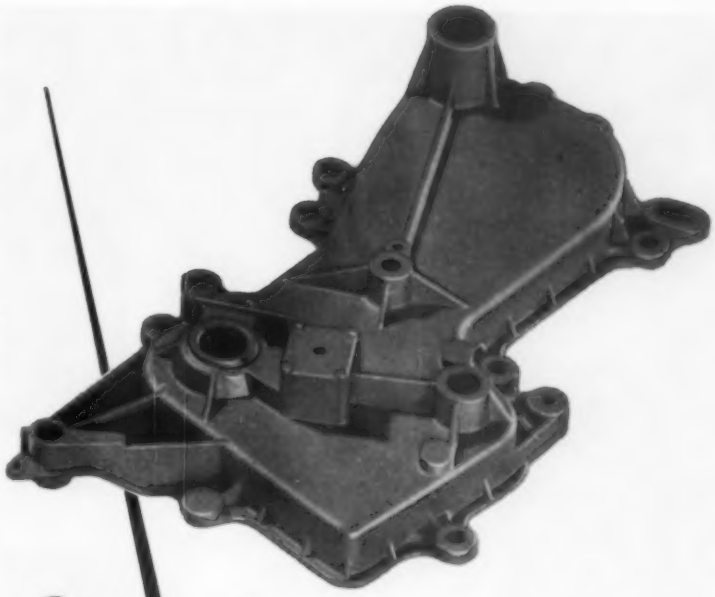
**11.** PERMANENT MOLD CASTINGS in special bronze can save money by reducing assembly cost, reducing machining and in other ways. The complete story is available from Alcaloy, Inc.

**32.** SOUND DIE CASTINGS start with the die casting machine. Bulletin 5400 from the Hydraulic Press Mfg. Co. describes how their machines will give sound castings.

## BUYS CYLINDER DIVISION FROM LINDBERG

Elbert M. Gage, president Teer, Wickwire and Company, Jackson, Mich., has announced his company's purchase of the Lindberg Air and Hydraulic Cylinder Division from Lindberg Engineering Company, Chicago.

The purchase covers entire stock, machinery, designs and development work of Lindberg Air and Hydraulic Division.



Versatility and engineering know-how go hand in hand at Paramount.

We have specialized in meeting die casting needs of a wide range of metal products.

Whatever your die casting needs, Paramount's *complete* service will meet your requirements. By *complete* we mean (1) Design experience with all types of castings—large or small, simple or complex; (2) Tooling ingenuity; (3) Modern production facilities both for casting and machining.

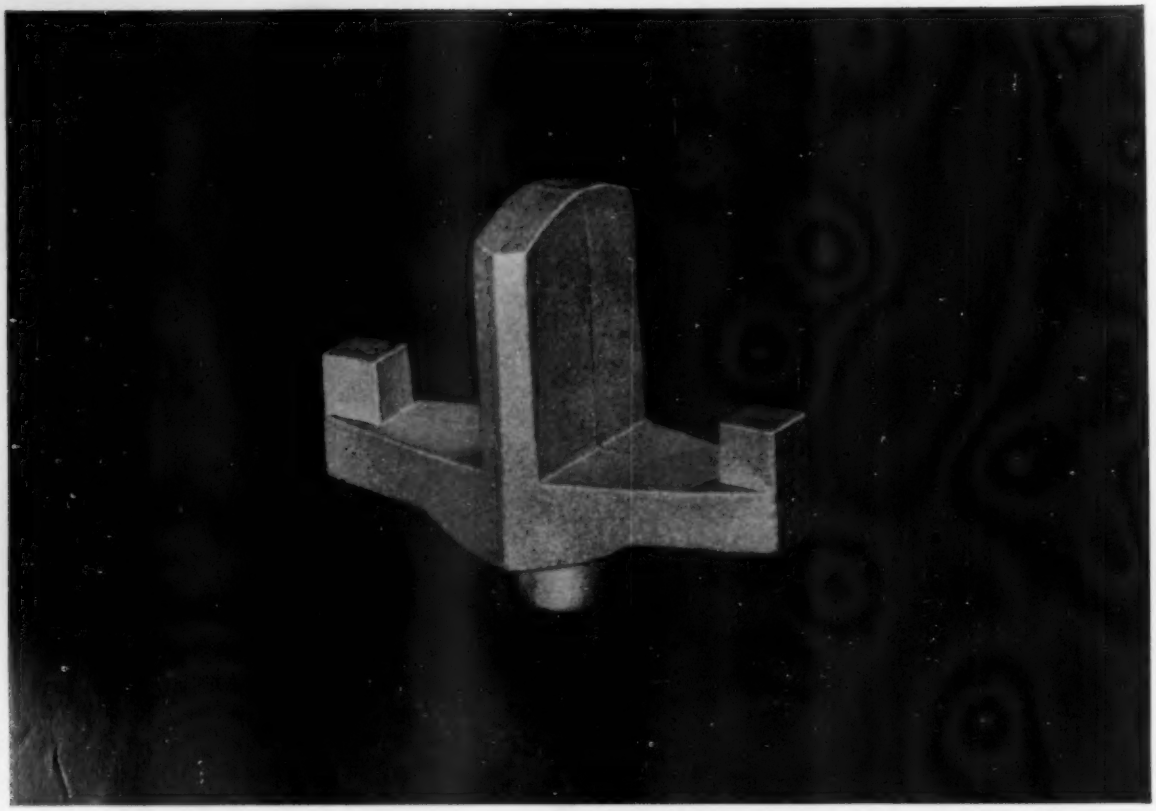
**PARAMOUNT DIE CASTING CO.**
St. Joseph 7, Michigan

*Write for brochure detailing Paramount facilities*

PARAMOUNT
Die Casting
Company

**ALUMINUM • MAGNESIUM • ZINC**

*For more information circle No. 74 on the Reader Service Card*



**Monel clamp,** precision investment cast by Inco, resists corrosion and erosion in carbon packing ring assembly for Navy steam turbine. Inco precision casting cut production cost 50%.

## On this clamp Inco precision casting

# saves 8 operations— reduces cost 50%

Drill one hole, and this Inco precision cast Monel clamp is ready for a carbon packing ring assembly.

The assembly is made by Chas. E. Chapin Company of Rutherford, New Jersey. It seals in steam on auxiliary steam turbines for the Navy.

Originally, made by forging and machining, the clamp required eight different operations. *Inco precision casting got rid of all operations except drilling one mounting hole, cut Chapin's production cost 50%.*

*Where can you save with Inco precision casting?*

Do you have a part which is 6 inches by 5 inches or smaller? Does it weigh under 3 pounds? Require starting tolerances as close as plus or minus .005 inch per linear inch? And need 5 or more fabrication steps? If so, there's a good chance you can cut cost and improve design by having the part precision investment cast by Inco.

Inco precision casts most high-melting point alloys from carbon steel to the new super alloys.

**THE INTERNATIONAL NICKEL COMPANY, INC.**
67 Wall Street New York 5, N. Y.

### 5 Advantages of INCO Precision Casting

- Save up to 60% of production costs.
- Longer life with harder alloys.
- Little or no machining required.
- Wider design latitude.
- Higher alloys at lower cost.

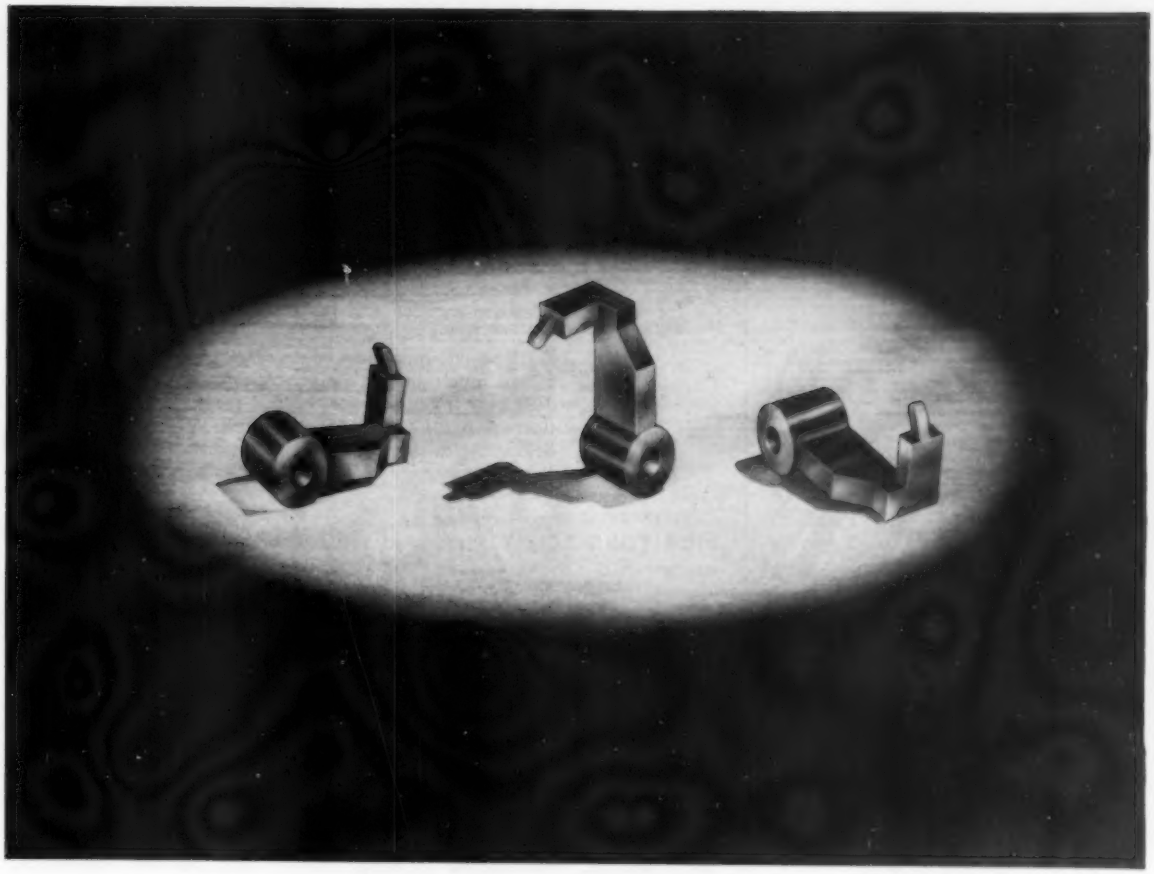
**Get This Helpful New Booklet**

Trying to keep costs in line on some small part? Then write for new 16-page booklet, "Cast to Outlast." Contains many case histories detailing how others cut costs with Inco precision casting. There is a good chance this helpful data will suggest a practical way to cut your costs, too.

INCO TRADE MARK

**Inco Castings** *Precision · Sand · Centrifugal*

*For more information circle No. 34 on the Reader Service Card*



# Impossible in Powdered Metal?
# Not at PARKER

**PARKER**
**SALES ENGINEERS**

**CHICAGO 49, Ill.**
Ollie J. Berger Company • 2059 East 72 Street

**CINCINNATI, Ohio**
William H. Broxterman • 2174 Buck Street

**DETROIT 35, Mich.**
Hodgson-Geisler Co. • 18917 James Couzens

**GIRARD, Penna.**
Daniel F. Marsh • 35 Chestnut Street

**KIRKWOOD 22, Mo.**
Edward F. Higgins, Jr. • 102 West Adams Street

**WILTON, Conn.**
Girard L. Palmer • Belden Hill Road

**SYRACUSE, N. Y.**
J. C. Palmer • 712 State Tower Bldg.

**BELLEFONTE, Penna.**
Warren G. Olson • 420 East Linn Street

This part—with projections in several planes, not to mention an I.D.-O.D. section—looked like an impossible job for powdered metal. Yet Parker made it in **one press operation**—complete—to close tolerances and tight "specs"—at relatively **low cost.**

This unusual piece points up the advantages offered by Parker powdered metal processing. Tough cost problems of conventional casting and machining methods often can be solved. Tensile strength, ductility and impact resistance can be closely controlled to meet rigid specifications. Powdered metal constituents can be precisely and uniformly blended for a wide range of requirements.

Parker's experience and facilities in producing a wide variety of powdered metal parts have saved money—and solved problems—for many users. Your problem may be one that Parker can solve in like manner. Just call the nearest Parker sales engineer listed at the left.

**Parker White Metal Company • 2153 McKinley Ave., Erie, Pa.**

**PARKER**

**POWDERED METAL PARTS**
**ALUMINUM and ZINC**
**die castings**

*For more information circle No. 52 on the Reader Service Card*

Every day is Saturday...

at Belmont!

If our ingots were infantrymen, they'd blow their tops! For every day—and all day—is inspection day at Belmont.

Not a single drop, square, stick, grain or ingot "gets by" the critical eye of Belmont metal experts in anything short of perfect condition...at any stage of production.

And Belmont quality is exceeded *only* by Belmont service—the result of 59 years of "falling in" on time.

Better buy Belmont...for both!

**Belmont**

**SMELTING & REFINING WORKS, INC.**

307 BELMONT AVENUE • BROOKLYN 7, NEW YORK

*"Putting Mettle into Metals Since 1896"*

*For more information circle No. 15*


# BETWEEN THE LINES

**SOMETIMES OBSCURED** by the vast tonnages of die castings in today's autos are the important applications of die cast parts in other types of products. Actually, although automobiles account for a larger total usage, the manufacture of such items as photographic equipment, portable tools and household appliances rely upon die cast components for a much larger percentage of their construction. Just how important these other major fields of application are will be explored in a series of articles in PMM, beginning in this issue with the photo supply industry. It begins on page 31.

**PICK YOUR ALLOY** wisely and you can often save yourself money and delivery time. That's the general theme of an article on castability of investment casting alloys in this issue. Beginning on page 41, it grades alloys in each metal group according to their relative castability.

**COMMON PROBLEM** in die casting is the casting which is deeper than one-half the die opening. A neat solution to this problem is reported on pages 44 and 45. Here a method of removing the casting from the deep core is illustrated and described.

**AUTOMATIC FINISHING** is being widely used on die cast parts. Enormous quantities of identical die castings are "natural" factors in favor of the large installations of automatic equipment. The editors of PMM have recently seen numerous such installations for plating and painting die cast parts, and will give you photographic reports on them during the coming few months. This month, on page 56, is an article on a major set-up for automatic plating at National Lock Company.

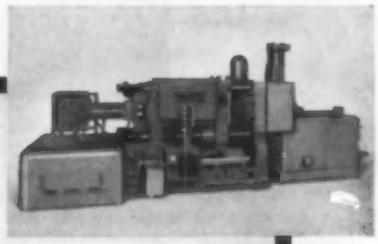
**YOUR ABRASIVE BELT** department may include long lines of backstand machines or a couple of rotary automatics for pre-plating operations, or it may consist only of one or two free-belt setups for clean-up work. But it is almost certain that if you are processing die cast parts in your plant, you have one or more abrasive belt machines. To help you get the most out of your belt finishing, we interviewed an authority on this type of surface finishing. His answers to our questions begin on page 51.

**LIVES DEPEND** upon an aircraft safety device built largely of investment castings. This is an automatic lap belt for pilots of jet aircraft, to be described in a feature article in PMM next month. Both beryllium copper and stainless steel castings are used.

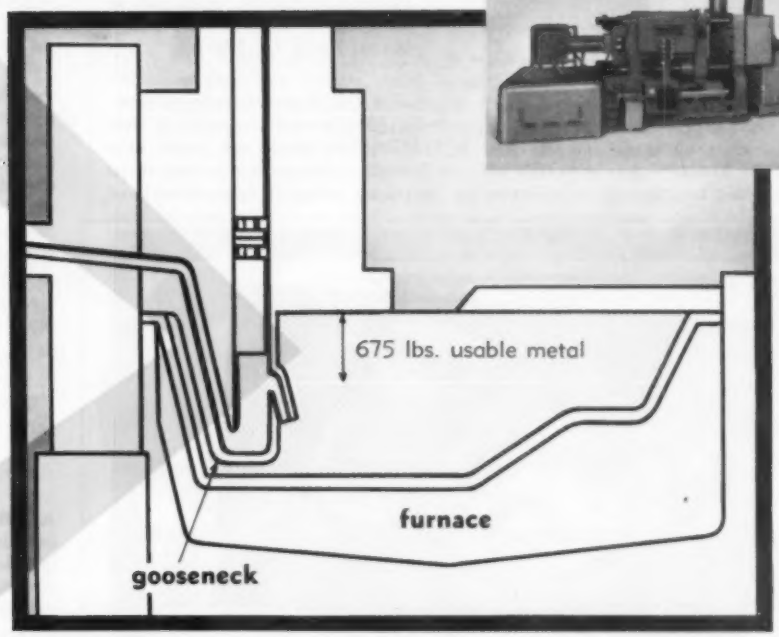
**FAST FASTENING** techniques have been developed for assembling die castings. The special characteristics of die cast alloys, plus the accuracy of the die casting process, make it practical to use rapid assembly techniques. These will be reported in a feature in the August issue of PMM.

**REED-PRENTICE**

**DIE CASTING MACHINES**



# 675 lbs. usable zinc




## NEW gooseneck & furnace arrangement increases melting pot capacity

Re-designed Gooseneck and Furnace increase melting pot capacity to 1700 lbs. of zinc on the REED-PRENTICE #2 die caster; to 1150 lbs. of zinc on the #1½ model.

This new design provides 675 lbs. of usable metal above the liner port, gives more efficient production these ways:

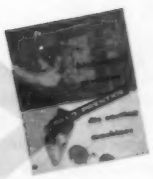
**1 - pot life lengthened by elimination of stress points;**
**2 - permits longer operation without re-fill;**
**3 - requires less of operator's time and attention.**

A quick-change plunger coupling is incorporated for easy adjustment of Gooseneck, plunger and nozzle. Entire furnace assembly can be lowered quickly to use lower die plate hole.

**CAPACITIES**

| Machine | lbs. Zinc/shot | Melting Pot (with Gooseneck in Place) |
|---|---|---|
| #1½ | 15 | 1150 lbs. |
| #2 | 17½ | 1700 lbs. |

**free**



Complete information on REED-PRENTICE die casting machines. Write for your copy.

**REED-PRENTICE CORP.**

**WORCESTER 4, MASSACHUSETTS**
*Affiliate of* **PACKAGE MACHINERY COMPANY**

**REPRESENTATIVES:** Houston—Steel & Machine Tool Sales Co.; Seattle & Spokane—Star Machinery Co.; Minneapolis—Chas. W. Stone Co.; Los Angeles—Western Molders Supply Co.

**BRANCH OFFICES:** 75 West St., New York 6, N. Y.; 1213 West 3rd St., Cleveland 13, Ohio; 4001 N. Elston Ave., Chicago 18, Illinois; 2842 W. Grand Blvd., Detroit 2, Michigan.

*For more information circle No. 56 on the Reader Service Card*

# A review of recent U.S. PATENTS

A PROCESS for preparing a mold for casting molten metal in which a mixture of sand and incompletely cured resin, in sufficient quantities to render the mixture plastic, is formed into a sheet. The sheet is then pressed over a die and the assembly heated to completely cure the resin and develop a mechanically strong mold.

(Patent No. 2,705,822—Molding Procedure—Gosta Vennerholm, assignor to Ford Motor Co.—issued April 12, 1955).

A PROCESS for cleaning aluminum alloys which consists of dissolving the aluminum oxide in a fluorine-containing solution to produce a film of fluoride salts of the base metal on the aluminum. The part is then rinsed in water and immediately immersed in an aqueous chromic acid—alkali sulfate bath.

(Patent No. 2,705,500—Cleaning Aluminum—Leon L. Deer—Issued April 5, 1955).

A LIQUID METAL valve having a chamber to contain liquid metal that is surrounded by an electric induction coil. The sides of the chamber form a side pouring opening beneath the level of the molten material and the electric induction means is arranged to deflect the bath away from the side pouring opening to prevent pouring.

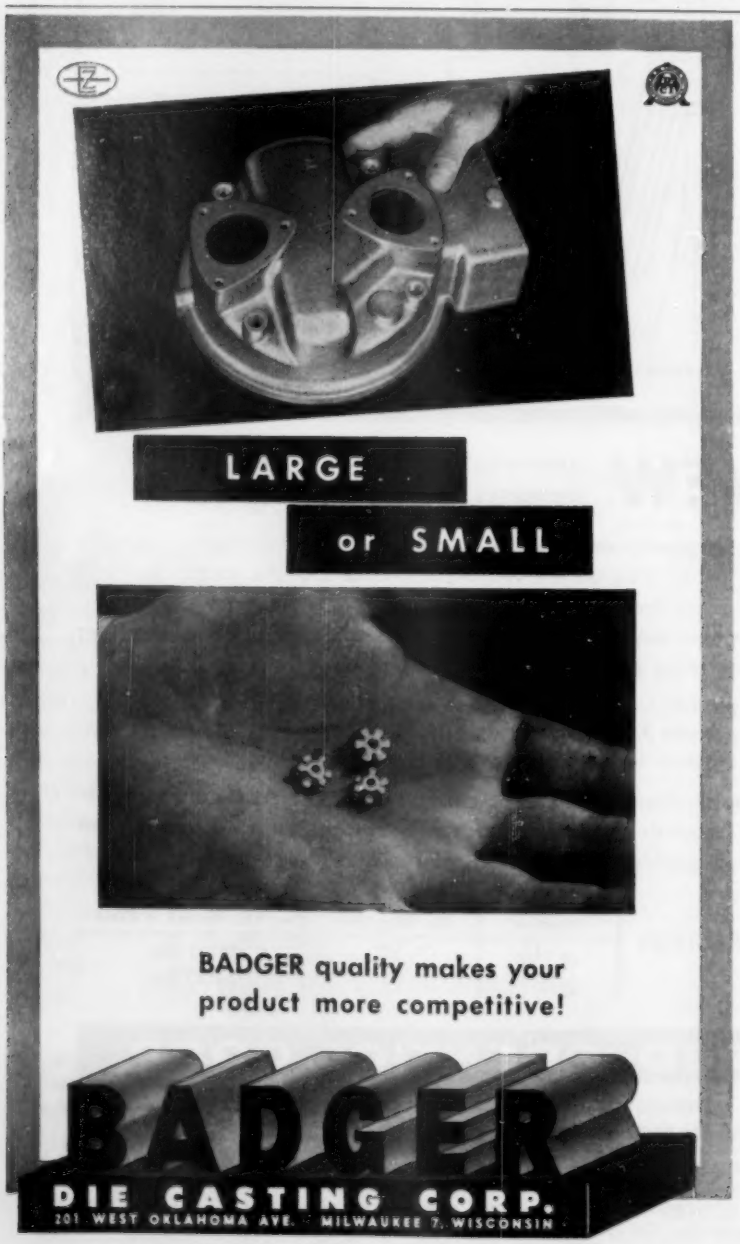
(Patent No. 27,070,720 — Electromagnetic Valve—Mario Tama, assigned to Ajax Engineering Corp.—Issued May 3.)

A PROCESS for improving the bearing qualities of a sintered powdered metal bearing. The compacted powdered metal bearing is heated to sintering temperature while in contact with a densifying metal to infiltrate the pores of the bearing. The bearing is then reheated in contact with antimony to a temperature above the melting point of the antimony but below the melting point of the sintered bearing. This second heating effectively infiltrates all of the pores of the bearing with antimony.

(Patent No. 2,706,693 — John Haller, assignor to Allied Products Corp.—issued April 19.)

A PROCESS for infiltrating a porous powdered metal part with another metal while preventing surface erosion of the powdered metal part during the infiltration. A porous cup of the same kind of metal as the part is provided so that with the part to be infiltrated positioned on top of the cup and the infiltrating metal contained in the cup; the infiltrant passes by capillary action through the cup and into the part and in doing so surface erosion is effectively prevented.

(Patent No. 2,706,694 — John Haller, assignor to Allied Products Corp.—issued April 19.)

For more information circle No. 14 on the Reader Service Card

A METHOD for the production of titanium and zirconium metals. The oxide of the metal to be produced is mixed with a reducing agent consisting of magnesium and not more than 18% calcium, both materials being substantially nitrogen free. The mixture is heated in an inert atmosphere to a temperature between 1000 C and 1100 C to affect partial reduction of the oxide.

After reaction the partially reduced oxide again treated in an inert atmosphere with a reducing agent composed of metallic calcium and not more than 21½% of magnesium with approximately 0.017% nitrogen.

After heating for a sufficient time for complete reduction to occur the mass is cooled and leached. By this process the titanium and/or zirconium is produced in a powder form and the cost of material and the nitrogen content of the powder are both kept low.

(Patent No. 2,707,697—Methods of Producing Zirconium and Titanium — William C. Lilliendahl & Edward Gregory, assigned to Westinghouse Electric Corp.—Issued May 3.)


For more information circle No. 9 on the Reader Service Card

AUTO-DIESEL PLUNGER RINGS *last* MONTHS *not* HOURS

*will give you over* 100,000 SHOTS Per Set

There was a time when plunger rings would last only a FEW HOURS. That was before Auto-Diesel Engineers developed their new Hardened Steel Plunger Rings. They last for MONTHS instead of HOURS. IN MANY PLANTS THEY ARE GIVING OVER 100,000 SHOTS PER SET. (Names supplied upon request). They are made of cast iron, dieloy cast iron or hardened steel. Anyone operating die casting machines or casting zinc parts can save money. It will pay to write for details.

AUTO-DIESEL *can supply..*

TWO or THREE PIECE Plunger Segment Rings

Auto-Diesel 2 or 3 Piece Plunger Segment Rings will give you LONG LIFE and reduce expensive down time. Especially made for hot chamber die casting machines. Made of high grade wear resisting iron in sizes from 1½" to 4" by ⅞".

***Write for Details***

THE AUTO-DIESEL PISTON RING CO.
3135 Superior Avenue • Cleveland 14, Ohio
"RINGS and SHAPES *Since* 1921"

# PERFECT!

HB&S HB&S HB&S HB&S

*...for complete satisfaction*

CHOOSE **HENNING**

## ZAMAK (Zinc Base) DIE CASTING ALLOYS

Once you taste the difference between ordinary alloys and H. B. & S. you'll never have an appetite for anything but HENNING products.

We strap Zinc Base Die Cast bars on metal pallets of the same alloy to speed handling in your plant. H. B. & S. alloys meet all Government; ASTM and SAE specifications.

Shipments made promptly by truck or carload lots from our own private railroad siding.

***(On that next order specify HENNING and be convinced of the difference.)***

Are you receiving our monthly publication THE HENNING MESSENGER? We believe it will give you a chuckle or moment's relaxation during a busy day. Ask to be put on our mailing list.

**HENNING BROS. & SMITH, INC.**

91-113 Scott Avenue • Brooklyn 37, N. Y.

DEPENDABLE SERVICE SINCE 1922

For more information circle No. 29 on the Reader Service Card

# SCHULTZ

## . . . is known for its production of quality Zinc Die Castings and Superior Service

■ Because of its long outstanding record for expert craftsmanship, reliability and integrity, Schultz has become one of the nation's foremost suppliers of quality zinc die castings to an ever-expanding list of manufcturers in more and more industries.

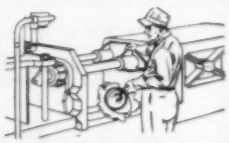
Users know that they will always get superior castings at the right price and on-time deliveries when they place their orders with Schultz. Each casting — be it simple or highly intricate, in large or small quantities — is produced under quality-controlled methods so that it is precise in analysis and exact in dimension and specifications.

If you need zinc die castings or design and engineering advice, call on Schultz — our specialized knowledge and service are at your call. We would welcome the opportunity to quote you on your needs. Send us your prints and we will furnish a prompt quotation.

DEPENDABLE ON-THE-SPOT SERVICE

DESIGN AND ENGINEERING SERVICE

DIE AND TOOL MAKING FACILITIES



MODERN PRODUCTION FACILITIES

QUALITY CONTROL FACILITIES

MACHINING FACILITIES

A COMPLETE AND DEPENDABLE DIE CASTING SERVICE

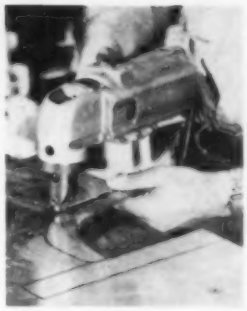
**SCHULTZ DIE CASTING COMPANY**

1810 CLINTON STREET • TOLEDO 7, OHIO

*For more information circle No. 37 on the Reader Service Card*

# CASTING ABOUT

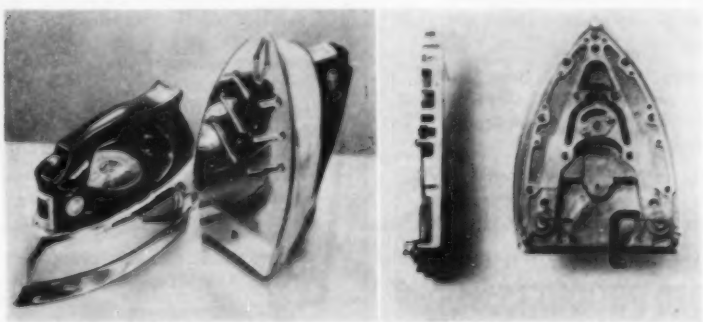
**NIBBLING STAINLESS** is one of the important uses for a new light-duty Nibbler recently put on the market by Fenway Machine Company. This sturdy, portable metal-cutting tool has three major components that are die cast in aluminum because of the close tolerances and production savings that are possible. These die castings are the die, die-holder and connecting link. The Fenway Nibbler is reported to cut (with a punch and die action) all types of stainless steels—martensitic, ferritic and austenitic—as well as light plate or sheet stock of cold rolled steel, aluminum, copper, etc. With each cutting stroke, the Nibbler removes a tiny slug of metal, without distortion or burrs.



**LIGHT AND HEAVY METALS** have teamed up to give a new type of electroplating anode: a rectangular bar of aluminum clad with lead has been developed by Reynolds Metals Company working with Knapp Mills, Inc. This combines the excellent corrosion resistance of lead with the electrical conductivity of aluminum. Reported advantages: 1) high conductivity for fast, uniform plating; 2) greater dimensional stability; 3) longer anode life by minimizing arc-off at the solution level; 4) competitive cost; and 5) lower weight.

**ALUMINUM IN CARS?** The average car this year has almost 30 pounds of aluminum, according to J. H. Dunn of Alcoa's Cleveland Works, who estimates that by 1970, each car will include more than 100 pounds of the light metal. True, 29.6 pounds is only a small fraction of the weight of a car, still it represents a total of 178-million pounds in the anticipated 6-million cars this year. Chrysler, leading the field among automotive users of aluminum, is reported by Federated Metals Div. of A.S. & R., to be using 60 pounds of aluminum castings per car, compared with only eight pounds of aluminum per car six years ago. These castings range in weight from a tiny speedometer oil wick housing weighing .002 lb., to a torque converter housing weighing 13.2 lbs. Die castings, permanent mold castings and plaster mold castings are the principle aluminum castings used.

**COMBINED ADVANTAGES** of die cast aluminum and stainless steel are obtained in a new "stainless" dry and steam iron introduced by the Hoover Company. The jobbing die casting division of Hoover has developed a secret process for bonding a 0.012 stainless steel sheet to a die cast aluminum soleplate, thus building the scratch-resistance of the stainless alloy into a lightweight die cast soleplate. High heat conductivity of the aluminum permits rapid, even heat distribution.



*Continued next page*

SERVING INDUSTRIAL AMERICA

QUALITY
SERVICE
DEPENDABILITY

Manufacturers of
Aluminum Alloy Ingots
Zinc Alloy Ingots

ALLOYS & CHEMICALS
MANUFACTURING CO., INC.

4365 Bradley Road
Cleveland 9, Ohio

ONtario 1-8600

*circle No. 5 on the Reader Service Card*

For more information circle No. 58 on the Reader Service Card

# STROH

SOMETHING TO CROW ABOUT

**Has Been Producing Excellent ZINC DIE CASTINGS Since 1903**

We are a bit proud of the fact that numerous of our customers are in the third generation.

"Teddy" Roosevelt was president of the United States when STROH first produced zinc die castings. The fact that we still serve many of these early accounts, we believe, speaks volumes for the excellence of our product.

*Inquiries Invited:*

**STROH DIE MOULDED CASTING CO.**
525 East Michigan St., Milwaukee 2, Wisconsin

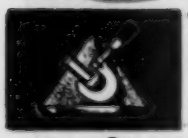
**Precision Made... For Precision Performance**

## POWDERED METAL PARTS

precision made from exclusively formulated non-ferrous Sintroloy and Ductiloy are molded to close tolerances, thereby eliminating machining of intricate shape and high scrap loss.

Perhaps we may be able to help you solve specific parts problems. Get in touch with National Molded today for prompt attention.

Write today for detailed information and free literature on cost-saving standard bearings which are available from stock.



**NATIONAL MOLDED PRODUCTS, INC.**
40-42 S. ST. MARYS ST. • ST. MARYS, PA.

For more information circle No. 48 on the Reader Service Card

## Casting About — Cont.

**VITREOUS ENAMEL FOR ALUMINUM** is being field tested now by Minnesota Mining & Mfg. Co., who report the development of a non-toxic, chemically-resistant, lead-free vitreous frit. Decorative coatings for aluminum in buildings, household appliances, automotive trim and many other uses are foreseen.

**HIGH TEMPERATURE ALUMINUM** has been unveiled by Alcoa with the patenting of its new X2219 alloy, said to have excellent properties at 500 to 600 F. This alloy has been developed to meet the needs of tomorrow's supersonic aircraft, where high air frictions and engine heats threatened to raise the temperature of some parts beyond the efficient performance level of existing aluminum alloys.

**THE SUN'S RAYS** may some day be used to melt metal, according to Dr. Maria Telkes who described to New York members of the Electrochemical Society some of the actual and potential applications for solar energy. Solar furnaces, it was reported, are used to prepare high temperature refractories, solar stoves for cooking as well as heating air or water, and solar batteries for generating electricity.

**Tamms**

*New!*

Soft amorphous type

**MICRO-SILICA**

with these special features:

| | |
|---|---|
| Oil Absorption (G & C) | 34.4 to 40.3 lbs. |
| pH Value | 5.0 to 5.2 |
| Moisture | 0.5% |

*New improved equipment assures highest quality and production control.*

PARTICLE SIZE RANGE 1 to 15 microns

99% MINUS 10 MICRONS

WRITE TODAY FOR SAMPLES, PRICES AND SPECIFICATIONS

TAMMS INDUSTRIES, INC.
228 N. LA SALLE ST., CHICAGO 1

circle No. 60 on the Reader Service Card

**STRAIN GAGES** are being used by test engineers at Lester-Pheonix, Inc., to measure the locking pressure of their die casting machines. To avoid arbitrary ratings, the company, in cooperation with Prof. Dan Wright of Case Institute of Technology, has developed a technique recently described in the company's house organ.

**MACHINE TOOLS** will be in the spotlight during September, with the National Machine Tool Show and the Production Engineering Shows to be held simultaneously in Chicago September 6-17. The Machine Tool Show with 166 exhibitors will be held in International Amphitheater, and the Production Engineering Show will take place at Navy Pier.

**SHORTAGE OF GRADUATE ENGINEERS** is expected to last at least until 1958 and possibly 1960, according to the Engineering Manpower Commission of Engineers Joint Council. As reported by The Associated Industries of Cleveland, a conservative estimate of the annual need is 30,000 engineers; this year only 22,000 will be graduated. Supply and demand are not expected to come into balance before 1958.

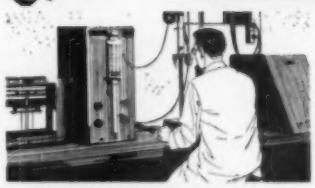
**VACUUM DIE CASTING** by a process first reported by PMM in March 1954 has now reached commercial production. Two jobbing die casters have simultaneously announced their active entry into the field. Formation of The Vacuum Die Casting Corp. has been announced by its vice president, Alfred P. Federman, while The Nelmor Manufacturing Corp. in whose plant Mr. Federman developed the process, also announced full-scale production. Vacuum Die Casting Corp. is located at 990 East 67 St., Cleveland, Ohio, and Nelmor is at 26440 Lakeland Blvd., Euclid, Ohio. The patented process calls for evacuation of the die casting die prior to making the shot of metal.

The process has been selected by R. P. Rousett, director of developments for Sparklets, Ltd., London, England, to be installed in the company's pilot plant. Sparklets has been granted a franchise for European rights to the process, and David Morganstern, executive vice president and general manager of Nelmor has gone to England to assist in setting up the pilot operation.

**IMPROVED CHROMIUM PLATING** methods are the subject of a new booklet available for $5 from the Office of Technical Services, Washington 25, D.C., based on research at Rensselaer Polytechnic Institute. The studies, sponsored by the Army Ordnance Corps, were aimed at discovering new ways to improve plating efficiency and quality.


Need pounds or tons of

Call on Cannon-Muskegon


Heats checked for chemical analysis.

High frequency induction furnaces.

Carried in stock are supplies of the 300 and 400 stainless steels as well as carbon alloys. "Specials" including electronic and aeronautical type alloys, tool steels, ferritic, austenitic and super stainless alloys of nickel- and cobalt-base. Available in shot, ingot, billet or cast bars.

**Exactly predictable metallurgical control of finished casting is assured by MasterMet control of high-temp alloys, tool, stainless, and carbon steels**

You specify the alloy — we'll tailor it to your needs, backed by a *certified* analysis! Name the quantity and the fast delivery will surprise you! Preparation can begin almost immediately after receipt of order. MasterMet "alloy tailoring" gives you all this:

**MATCHED ALLOYS TO YOUR MELTING PROGRAM** — Close control assures a constantly uniform melt. The results you get from a sample cast are the same as the final production run.

**MASTERMET CERTIFIED ANALYSIS**—Regularly furnished are notarized certificates insuring alloys that will cast to your exact production specifications.

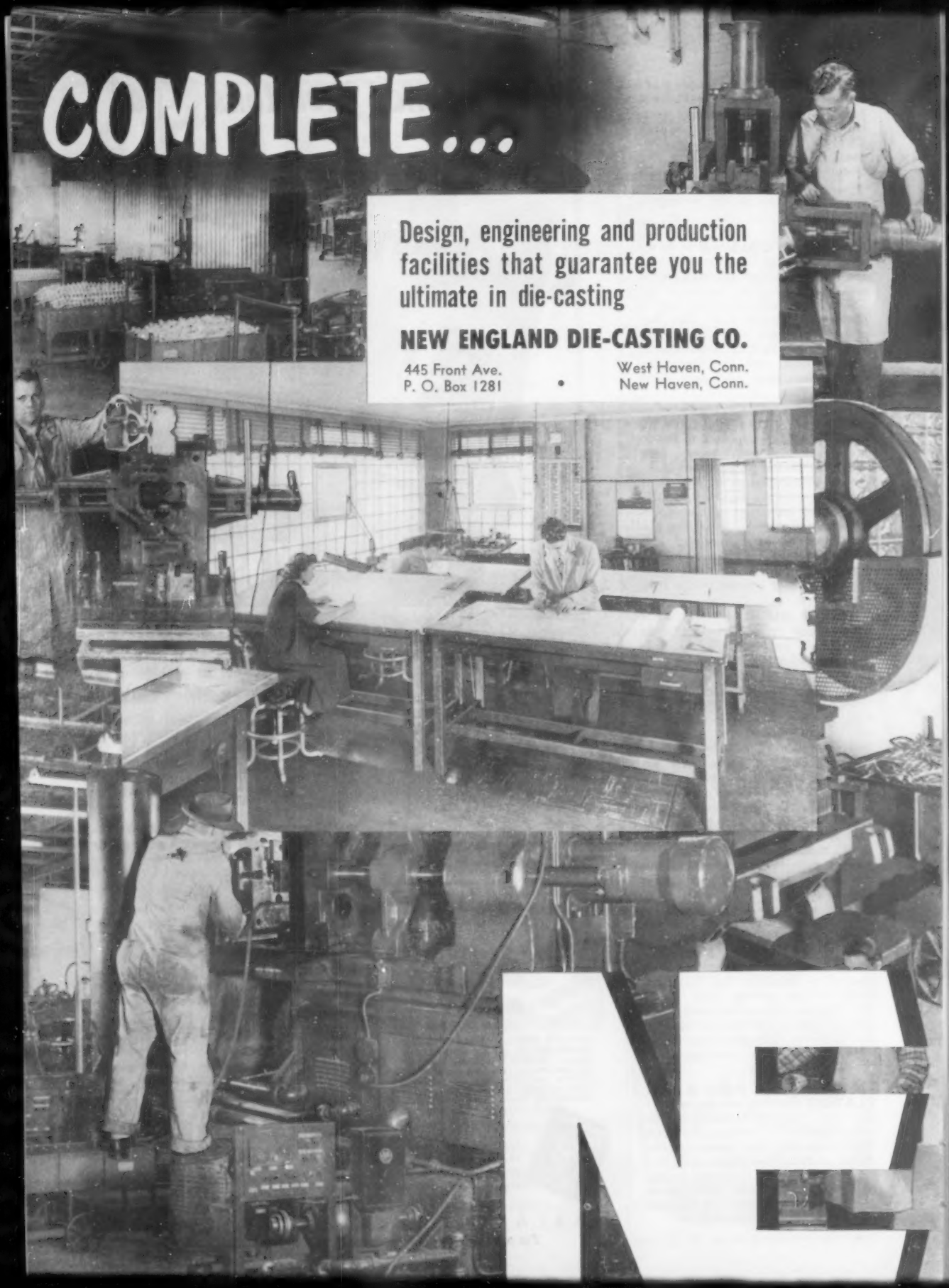
**PRODUCTION MELTS OR SAMPLE JOBS** — A combination of test furnaces and larger multiple production furnaces assure completely flexible service at any time.

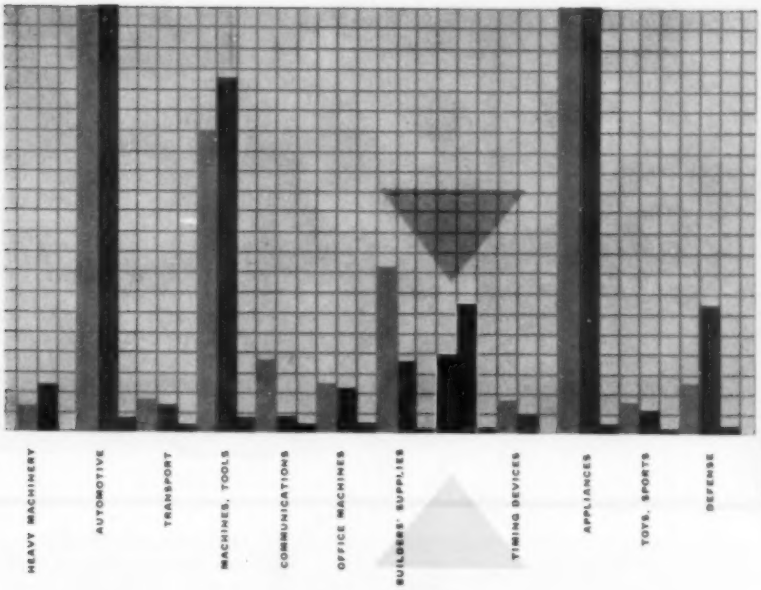
**FAST ACTION ON YOUR ORDERS** — No long delays for a mill run. Alloys delivered in drums, clearly marked with all specifications for fast selection and storage.

Write today for your copy of new MasterMet Alloy Bulletin for complete technical details.

Cannon Muskegon CORPORATION
TOP A TOP MASTERMET
2871 Lincoln Street • Muskegon, Michigan
METALLURGICAL SPECIALISTS

*For more information circle No. 16 on the Reader Service Card*


COMPLETE...
Design, engineering and production facilities that guarantee you the ultimate in die-casting
NEW ENGLAND DIE-CASTING CO.
445 Front Ave.
P. O. Box 1281
West Haven, Conn.
New Haven, Conn.
NE




# WHO Buys Die Castings?

# Photo Equipment

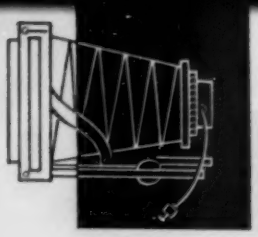
CONVERSION to die cast components is gaining momentum among the manufacturers of photographic equipment. More and more parts are being die cast to give better, lighter and sturdier equipment at lower cost to the buying public.

Here, as an example, are 20 die castings now used in Bell & Howell's magnetic recording projector... only eight were originally designed as die castings:

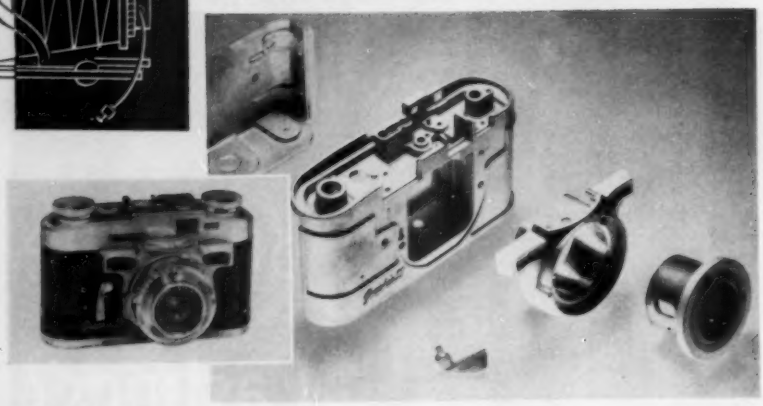
| Part Name | Weight # | Present Form | Original Form |
|---|---|---|---|
| Gear Case | .900 | Aluminum Die Cast | Same |
| Front Plate | .169 | " | Zinc die cast |
| Door Pull | .058 | " | Leather tab |
| Blower Housing | .544 | " | Same |
| Sound Head | 3.200 | " | Sand cast |
| Motor Housing | 1.400 | " | Same |
| Brush Holder Housing | .244 | " | Sand cast |
| Front Reel Arm | .275 | " | Sand cast |
| Relay Condenser Holder | .031 | " | Same |
| Take-Up Arm | .100 | " | Sand cast |
| Exciter Lamp Cover | .069 | " | Sand cast |
| Condenser Holder | .031 | " | Same |
| Lamp House Cap | .016 | " | Sand cast |
| Flywheel | 1.000 | Zinc Die Cast | Brass Bar Stock |
| Film Gate & Lens Carrier | .094 | Aluminum Die Cast | Zinc Die Cast |
| Lock Housing (accessory) | .150 | Zinc Die Cast | Same |
| Governor Cap | .300 | Aluminum Die Cast | Sand Cast |
| Rear Reel Arm | .325 | Aluminum Die Cast | Sand Cast |
| Fan Hub | .065 | Zinc Die Cast | Coined Stamping |
| Reel Arm Holder | .250 | Aluminum Die Cast | Sand Cast |

**Vernon E. Whitman, Director of Research, Graflex, Inc.**

"Although there must be exceptions in the case of items whose total production does not warrant this basic method of fabrication, there is little doubt but what *our general trend is to more and more reliance upon die casting as the foundation work on which our designs reach market through production.* Most of our products, being hand held in use, place a premium on light weight and minimum size: to this extent we are always seeking thinner sections and evaluating the latest developments in the use of the magnesium alloys. Because of the "pride of ownership" which influences many purchases in the photographic equipment market, we are continually on the alert as to alloys and die casting availability which can take a high grade plated finish without excessive cost. In common with many other industries, the *applications of die castings in our work can also be expected to increase in proportion to the closer tolerances which can be held (even across a parting line).*"



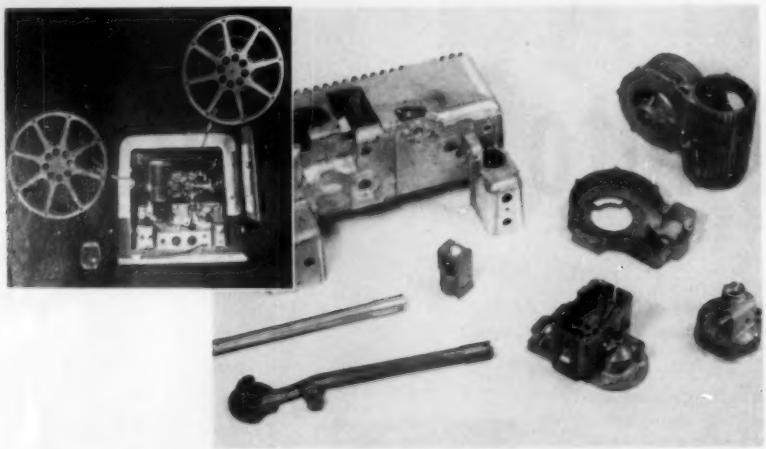
## WHO BUYS DIE CASTINGS?



# CAMERAS

• HAND-HELD equipment places a premium on lightness. Paring ounces from the structural elements of this camera from Graflex, Inc., improves its performance and sales appeal.

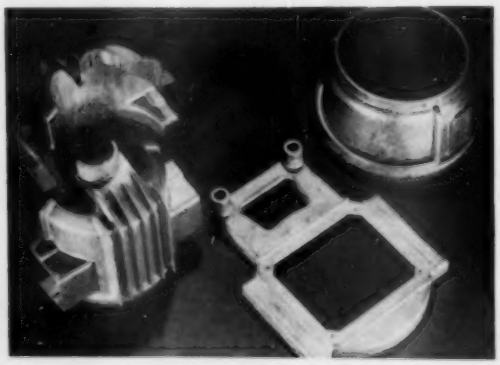
That's why magnesium die castings have been used for all major housing components, coupling the low specific gravity of magnesium with the thin-walled accuracy of the die casting. The high strength-to-weight ratio of this metal offers maximum protection for the precision mechanism. Note, also, the combination of finishes used.

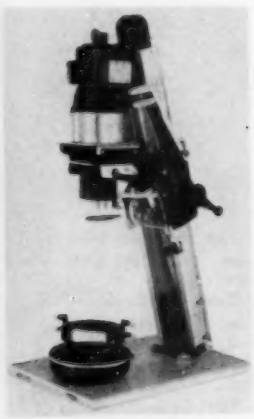


# PROJECTORS

• ONLY ONE-THIRD of all die cast components used in this Bell & Howell 16 mm movie projector are illustrated here. Not only are major mounting components, such as the large base piece, produced as die castings, but also housing, functioning and decorative parts are die cast.

The complex shapes of these parts, together with the high production requirements, rule out most other fabricating methods on the basis of economy. Close accuracy of the die castings minimizes machining.

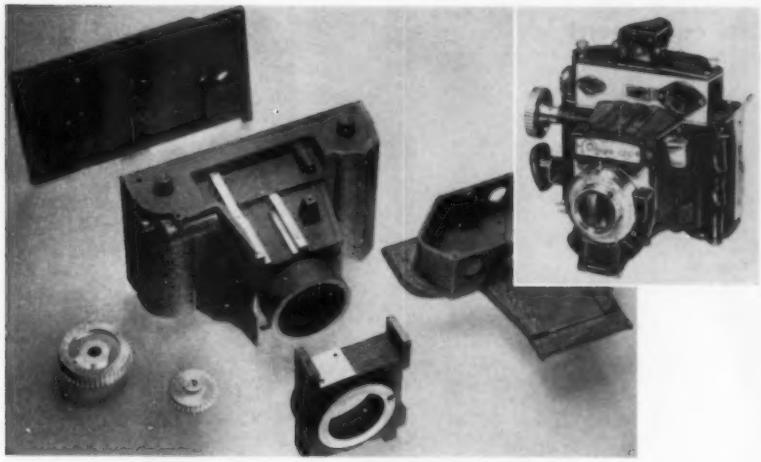




# ENLARGERS

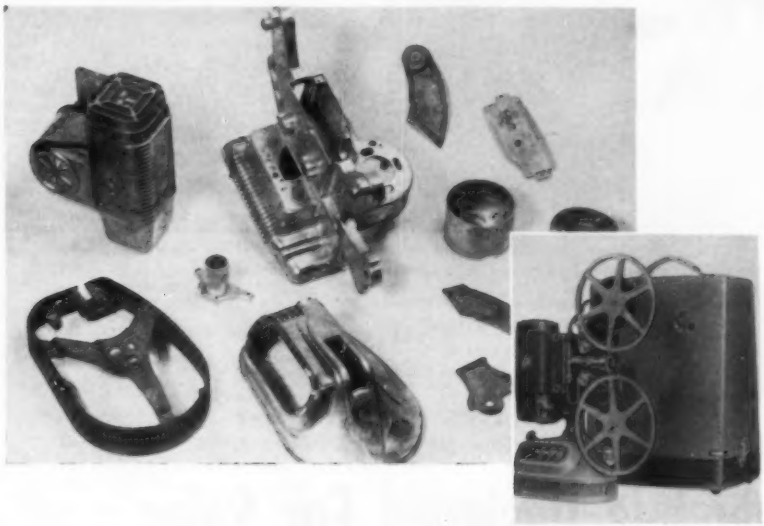
• MATING TONGUE AND GROOVE in identical die cast halves of the lamp housing, left, provides a complete and accurate assembly from a single die cavity. This is an example of the economies possible by die casting components for this Omega photo enlarger manufactured by Simmon Brothers, Inc.

The two-piece lamp housing from a single die cavity reduces original tooling costs and simplifies production and finishing processes. Die castings have permitted the optimum design at lowest cost.



• **WAR-TIME AERIAL** camera, now proving popular among amateur and professional photographers in peace-time, this Omega camera from Simmon Brothers, Inc. makes good use of die cast aluminum for low weight and extreme reliability.

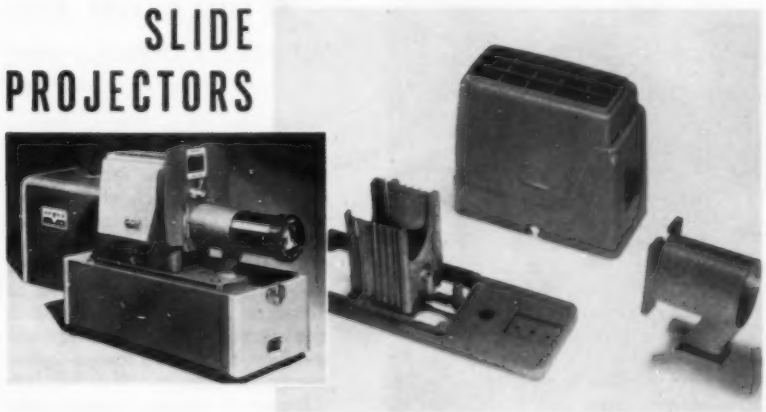
Its original military application made it necessary to design it for speed and dependability. Although price was not the primary objective, it is a fact that this unit costs less as a die cast assembly than would be possible any other way.



• **BOTH ENGINEERS AND STYLISTS** have their way when die cast aluminum and zinc are used to build a product, as in this 8 mm movie projector made by De Jur-Amsco Corp. The 11 die castings, large and small, represent almost a complete unit, needing only minor machining and assembly.

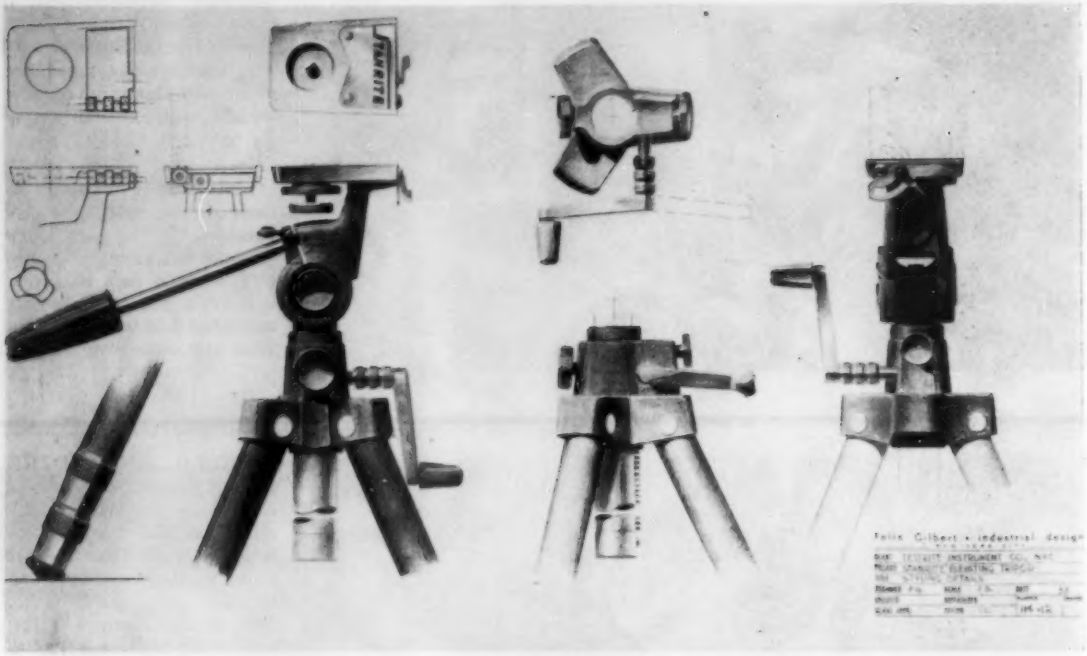
Note the dependability of the die cast components which are used for supporting members; see also the clean, crisp surface detail that reproduces the stylist's concept.

## SLIDE PROJECTORS



• **ALIGNMENT** and positioning are prime considerations in the design and operation of this slide projector by Argus Cameras, Inc. The close dimensional relationships, not only within a single die casting, but on related surfaces of mating castings, helps make this moderately-priced unit a precision product.

The close fit of these three pieces makes assembly and finishing much faster. An attractive organic coating applied to the surface adds both beauty and protection.



**1.** DESIGNER'S CONCEPTION of the product styling revealed in the detailed rendering, above, must be preceded by an intensive study of the client's requirements, as well as such limiting factors as production costs and process.

COVER STORY

# How Your Product Is Designed For Sales

**By FELIX GILBERT, ASME**
Packaging and Industrial Designer
New York

OF the many industries which have been "naturals" for the utilization of die castings, the photographic is certainly one of the largest, and is no doubt representative of the earliest ones to avail themselves of the advantages of pressure castings.

Photographic products for the mass-market must have "precision appeal", i.e., their appearance should exude mechanical elegance and reflect the painstaking engineering, research, and close production control which they do in fact embody. What applies to cameras pertains equally to accessory components, although certain of the latter permit greater production tolerances.

The Testrite Instrument Company of New York City, a leading manufacturer in the photographic field for nearly 40 years, determined to produce a new and smarter-looking tripod that was to embody as many useful features as possible. It was to be able to mount motion picture cameras as well as still cameras from 35 mm type up to the massive press and view models, with complete stability to its full extension of nearly six feet.

Inasmuch as this product was to be manufactured in great vol-

ume, competitively priced, and distributed nationally, there was little doubt from the start that die castings would play a major role in its design and production, both from the viewpoint of economics and that of styling-for-sales.

Seventeen die cast pieces, including a rack which is 15" long, go into each tripod assembly along with molded plastic parts, screw-machine parts, metal stampings and fasteners, and tubular of aluminum and steel.

The smooth appearance of die castings speaks for itself, and the as-cast surfaces permit a great variety of finishes from baked spray paints to electroplating in gold and chromium. Subtle styling could easily be machined into the dies with the assurance that the castings would be an accurate reflection of the approved designs. The tools for these castings were made in the Testrite shops. The metal moldings were cast of zinc alloy No. 5 by the Adept Die Casting Company.

Some of the "extras" found in the new tripods are:

A horizontal, die cast panning and panoram gear, rotating through a full 360 degrees, with 10-degree calibrations, and engaging a crank-driven Nylon worm, with no backlash;

A die cast, longitudinally-hinged camera plate with integral 90 degree quadrant, to permit tilting cameras full to the side, and making it possible to take vertical and horizontal exposures without remounting the camera;

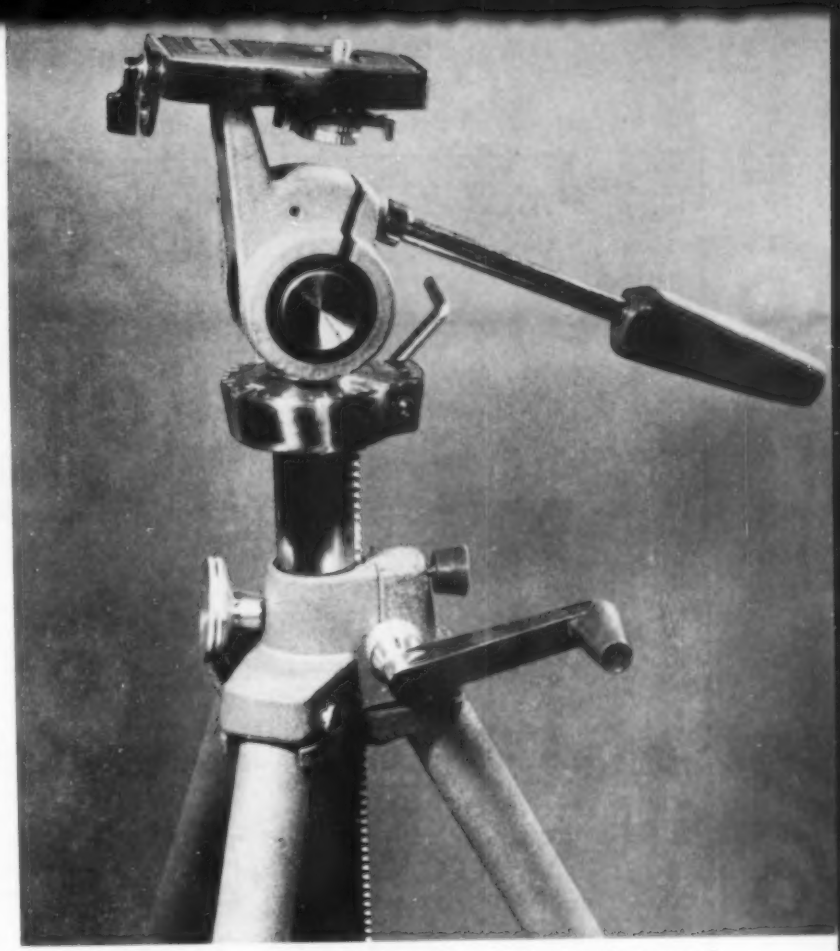
Integral calibrations on the sides of the tilt-top casting, for controlling elevation angle;

Die cast leg-top inserts with integral pivot pins;

Cast-in concavity on main casting to form bowl of ball-level;

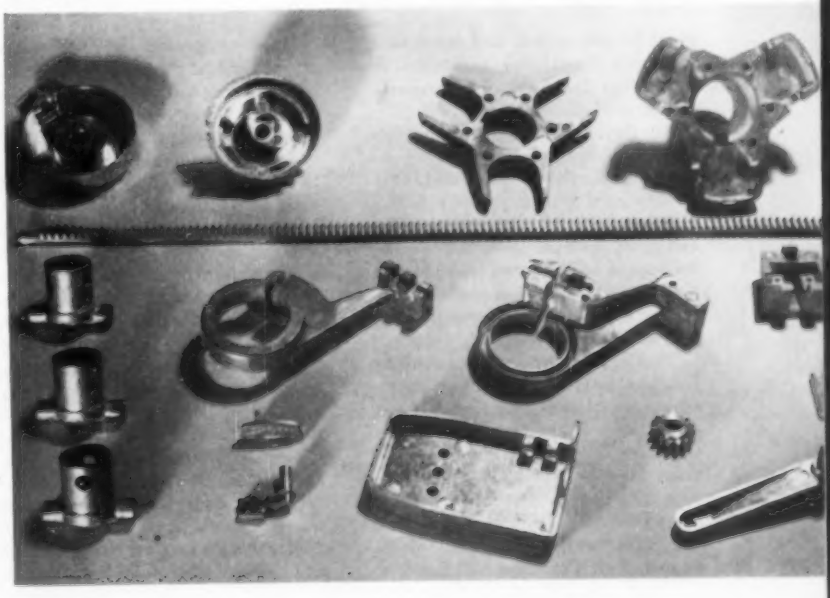
Spring-loaded pawl to prevent elevating post assembly from dropping inadvertently when locking screw is loose.

The styling of a product of this type presents an interesting challenge to the industrial designer. There are diverse functions, shapes, angles, motions, materials, textures, and colors, all of which

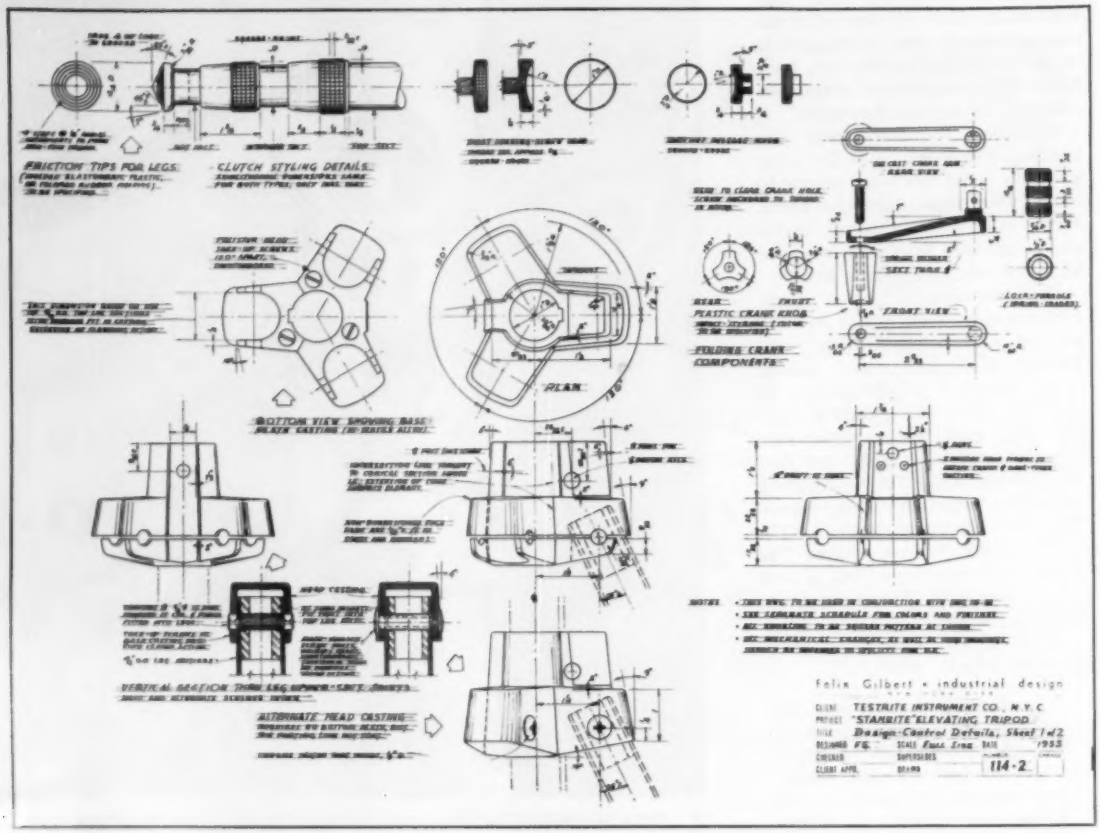


**2.** FINISHED PRODUCT employs materials, form, color and texture for customer appeal. Note how closely forms follow original design. Die cast components allow considerable design freedom.

**3.** SEVENTEEN DIE CASTINGS go into each new assembly. Longest piece is the 15" rack. Finishes include gold plate, satin and polished chromium plate and a baked crackle finish.



## "Good taste . . . plus sturdiness and economy . . ."




**4.** STYLING IS MORE than "pretty pictures," as evidenced by these typical design control drawings that are necessary to insure that the finished product will match the initial concept. Attention to details of this type is essential in product designing.

### *Three stages in product design . . .*

must be reconciled and composed into one functional assembly in order that the product be regarded as well-designed.

At the same time, numerous elements may be exploited to achieve a desired end-result. Our design goal was simplicity without bareness, attractiveness without going bizarre; in other words, an appeal to the good taste of the consumer as well as satisfaction of his requirements for a sturdy and economical product.

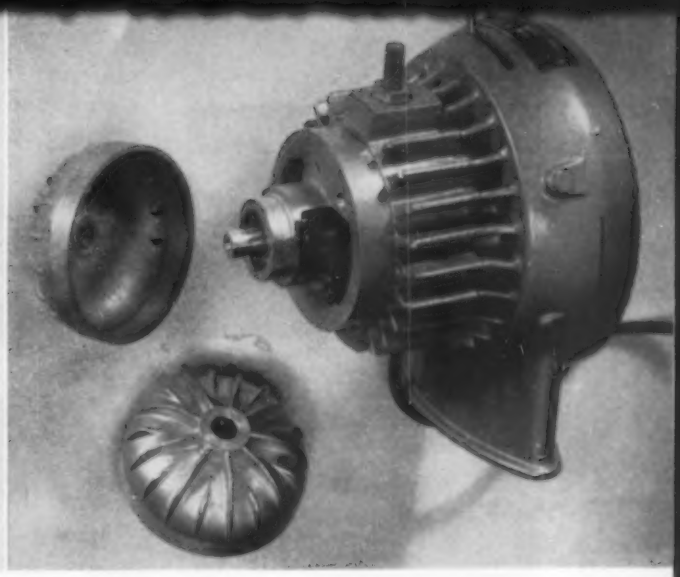
The first stage was a thorough familiarization with the client's aims, problems, and production limitations. Stage two was the development of our recommendations for the new appearance design. The design presentation rendering shown in Figure 1 was the culmination of literally dozens of sketch studies.

Upon approval of the basic styling, stage three was initiated: the drawing-up of design-control layouts. These are accurate, detailed mechanical drawings which hold all dimensions and proportions which affect the styling, and take into full account the geometry of the product, and materials and processes to be utilized. These blueprints are vital to nearly all the work which follows, and are, in effect, a visual design specification, supplemented of course with written specifications, and color, finish, and typography schedules. Their use is for the tool designers, development engineers, and the model makers, serving as the sole styling guide to these people in the absence of the designer.

The design control drawings for the Testrite tripod are shown greatly reduced in Figure 4. How closely the finished product resembles these plans can be judged by a comparison with Figure 2.

It should be understood that the design control drawings in no way obviate stage four: the machining of a prototype which may be either a finished mock-up, or else a working appearance model. The great value of stages three and four is that as the work advances additional refinements generally suggest themselves, and the time to make them is "before the die is cast".

It is another example of where close teamwork between the executives, the designer-stylist, the production and development directors, and the custom contractors who perform the die casting and molding, has paid off real dividends in a better product and increased satisfaction for all concerned.



GOOD THERMAL PATH is provided by a die cast aluminum fan in the flour mill, left, designed for home use. Die casting, shown at right, is designed for good axial air flow for better heat exchange.

DIE CASTINGS

# Longer Life For Small Motors

DESIGNERS of small motors for all sorts of appliances are continually faced with the problem of building more and more power into an increasingly smaller package. This trend is particularly true in motorized home appliances where not only physical size but weight as well, must be held down.

This particular problem was faced by the engineers at the Lee Engineering Co. when they designed the small, home, flour mill, above left.

In order to secure the power required to mill a hard wheat satisfactorily and, at the same time, keep the size and weight of the motor within practical limits, it appeared necessary for the motor to operate at considerably above its economical top temperature. The higher temperature had two adverse effects: as little as 10 degrees Centrigrade rise in operating temperature above normal can shorten the life of the motor by as much as 50 percent and, at the same time, the permeability of the iron may be cut by from 20 to 30 percent with corresponding power losses.

It is obvious then, if a means can be found to dissipate more rapidly the heat generated, it should be possible to load the motor more without any sacrifice in either power output or motor life.

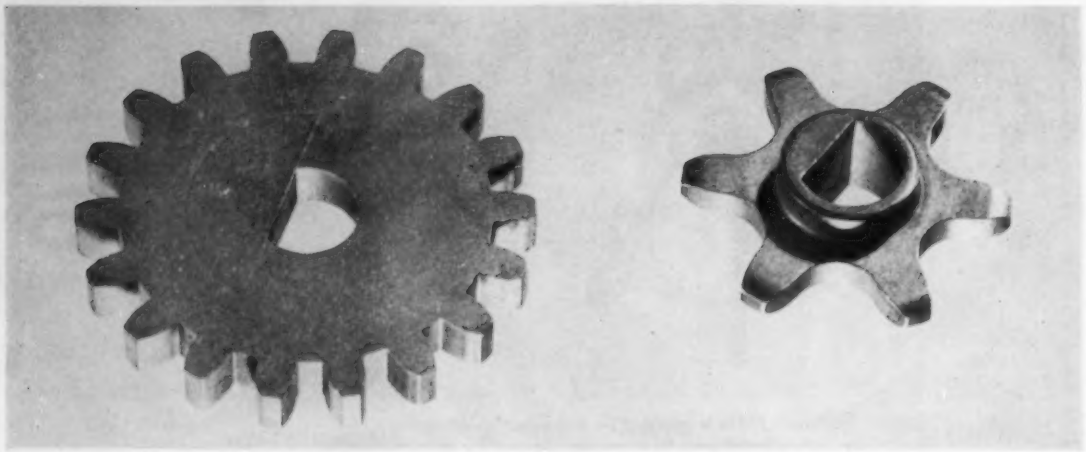
Solution to the problem is the use of a 75ST aluminum shaft and an aluminum die cast fan. Because of its superior thermal conductivity the aluminum shaft conducts heat away from the armature much more rapidly than a steel shaft of the same size.

The die cast aluminum fan not only continues the good thermal path, but, as can be seen above right, is designed for axial air flow so that a better heat exchange between the fan surface and the air takes place giving greater heat dissipation by conduction.

The advantages of smooth surfaces, as cast, and good dimensional accuracy that are two of the inherent characteristics of the die casting process made it possible to consider only the best design, from the standpoint of heat exchange.

As cast by the Parker White-Metal Co., the cored hole in the fan needs a light reaming operation to secure the desired fit and the fan and rotor assembly must be balanced. Both of these operations are inexpensive and relatively simple.

For the particular motor shown, the amount of heat dissipated through the shaft and fan amounts to 50 or 60 watts, while the power out-put of the motor, using the same size and amount of both iron and copper was increased nearly 50 percent. The operating temperature, under full load, is held sufficiently low so that there is no sacrifice in useful life.



## Low tooling and piece costs on large quantities of

# Power Transmission And Bearing Elements

### Tungsten Carbide Tools Give High Quality Finish

BEARINGS are important elements in any power transmission system. Three bronze bushings, above, are typical of those being produced by powder metallurgy.

A. *Small sleeve bearing* for Ford door lock rotor: tolerances .001 ID and OD, and .003 on the O.A.L.; production rate 2000-2400 per hour; cost is less than one cent apiece in quantities of 250,000 to 1,000,000. Tools cost about $125 in steel, $240 in carbide.

B. *Flange bearing* for dial telephones: tolerances .001 total on ID; production rate 40,000 per day; cost is slightly less than two cents apiece; tools cost about $195 in steel, $325 in carbide.

Thin flange in relation to length of the part makes this difficult to produce. Flange which is .025 thick is molded by one action from the top and the balance of the part is molded by another action from the bottom. This helps avoid weakness in flange.

C. *Self-aligning spherical bushing* for electric fans: tolerances .0003 total on the bore which must be exceptionally smooth, maximum taper of .0001 and maximum out-of-roundness .0001 (Sheffield Precisionaire is used for high production gaging to these tolerances). Production rate 2000 pieces per hour; cost is slightly over four cents apiece; tools cost $364 in steel, plus $50 for carbide core pins.

GEAR and chain drives are commonly used in the actuating mechanisms of vending machines, and represent a suitable use for powdered iron gears and sprockets.

Satisfactory strength and hardness, accurate dimensions and perfect tooth contours are among the desirable features of powdered metal drive elements. However, low cost of the pieces suggest further usage of this type of component to replace gears and sprockets machined from wrought stock.

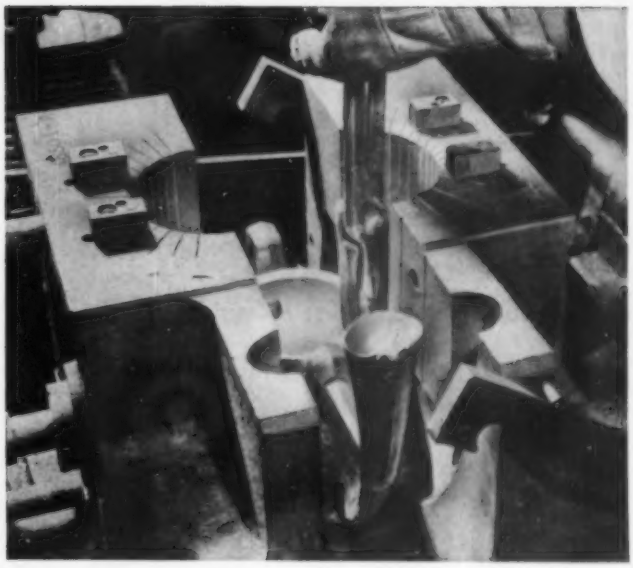
Two examples from current production are shown above. The sprocket and gear are components in the operating system of a soft drink vending machine; both are produced by International Powder Metallurgy Co., Inc. in lots of 20,000 and upwards at a time. The same company also produces the bushings illustrated at the left.

The sprocket was formerly machined from aluminum bronze with a Rockwell hardness of B 80-90. The powdered metal sprocket is produced from 95 percent iron — 3 percent copper composition with a density of 5.8 gr/cc. It is steam treated to hardness of Rockwell B 75, and is file hard.

Tolerances held on the sprocket are .005 on ID, .010 on OD and .010 on overall length. Tooling charge was $1850 and piece cost 9¢. Physical properties, cost and tolerances are about the same on the gear, with tooling cost of about $1150.

Both the sprocket and the gear were designed for production by powder metallurgy. Costs by any other method are estimated at twice or three times what the customer is now paying.

*use 'dag' dry films for trouble-free lubrication*



Where scratching or scrubbing soon removes an ordinary die coating, 'dag' dispersions adhere to the die surface and provide clean and easy release, casting after casting. 'dag' Colloidal Graphite works into the pores of the die metal, giving a slick, adherent, permanent *dry lubricating film.*

A die-caster tells us that he has used 'Oildag'® – 'dag' Colloidal Graphite in petroleum oil – diluted in carbon tetrachloride to coat his molds, and eliminated pick-up from the molten zinc he casts at 900°F. He makes more than a thousand castings per mold before touching up the dies, and his production has been speeded up more than 200%!

You'll find a surprising number of ways to use 'dag' dispersions described in our free literature. Write today for Reprint DC and Bulletin No. 26-T10.

**Dispersions of molybdenum disulfide are available in various carriers. We are also equipped to do custom dispersing of solids in a wide variety of carriers.**

***You get smoother castings, cleaner dies, with long-lasting 'dag' dispersions***

**ACHESON COLLOIDS COMPANY**

PORT HURON, MICHIGAN

...also ACHESON COLLOIDS LIMITED, LONDON, ENGLAND

*For more information circle No. 3 on the Reader Service Card*

## Which alloy for your investment casting?

## Before you decide, give some thought to

# Castability: Its Effect On Alloy Selection (Part Two)

By **WALTER A. DUBOVICK,** Engineered Precision Casting Co.

### CASTABILITY RATING OF METALS

THE preferred casting materials come close to meeting all of the specifications of the ideal material. The fewer number of pertinent qualifications which a material can meet, the poorer its castability. By giving each of the casting qualifications a numerical value, it is possible to obtain a numerical rating for every material which would be an indication of its relative castability when compared to the "ideal" material in its group. Most producers have sufficient actual experience to draw upon from their files so that it isn't necessary for them to actually resort to a rating system of this type.

Special equipment or techniques which some producers have developed can change the castability rating of a material from poor to fair or even good.

The castability rating is of necessity a relative one. The composition of investments isn't the same in all plants nor is the melting equipment. Melting practice also varies and sometimes plays an important part in determining whether or not a material can be considered good or poor in castability.

If we disregard the foundries with exceptional facilities or techniques and the materials are rated in some manner as described above, we would find that their relative castability when graded from excellent to poor would be as follows:

### ALUMINUM AND ITS ALLOYS

For ease of handling, low pouring temperature and fine surface appearance, alloy 356 must be classed as very good. Alloys 43, 108, 195, 355 are also good and offer little difficulty to the caster. The sand casting alloys in general make good materials for investment casting.

High silicon alloys such as Vanasil, which is used because of its dimensional stability, have very poor castability and should be avoided.

The wrought alloys such as 24S, 61S, etc. and pure aluminum 2S have poor casting characteristics even when centrifugal force is used to drive the metal into the mold cavity. The use of vacuum melting and casting offers possibilities for their greater future use.

### COPPER BASE ALLOYS

Silicon brass and beryllium copper are the best casting materials of this group. Silicon bronze can be rated as good along with manganese bronze and phosphor bronze (88 Cu, 8 Sn, 4 Zn).

Leaded red brass or gun metal (85 Cu, 5 PB, 5 Sn, 5 Zn) and bearing bronze SAE 64 (80 Cu, 10 Pb, 10 Sn) have excellent fluidity but are subject to heavy drossing which can lead to detrimental inclusions in the castings. They are usually considered to have a fair to good castability rating but segregation may occur in SAE 64 and should be checked carefully as to application.

Naval brass has good casting properties in thin sections but is susceptible to heavy drossing in heavy sections. Aluminum bronze must be handled with extreme care and so falls in the category of being fair along with red brass (85 Cu, 15 Zn).

Red brass is specified where fair electrical conductivity is required but should be avoided if used for other reasons. The nickel silver alloys, in which nickel varies from 12 to 22 percent, are rated poor to fair.

Leaded yellow brass and electrolytic copper have very poor castability and should be avoided. Heavy gating and risering with low pouring and mold temperatures permit casting of copper in sections up to ⅜" with some success. Conductivity with careful melting practice will be 80 to 85 percent. Vacuum casting again offers a means for successfully using greater amounts of this material.

### CARBON AND LOW ALLOY STEELS

The low alloy and carbon steels, that is, .2 percent carbon or less, have poor castability, the rating becoming worse as the carbon decreases. Magnetic iron, or pure iron, with .03 carbon max., is perhaps the most difficult to cast of all commonly known materials. Its castability is worse than copper, since its high pouring temperature can cause reactions with investment materials.

The medium carbon steels are rated as fair with improved castability as the carbon content increases. Cast iron has fine cast-

IN PART ONE of this paper, which was part of a symposium by members of the Investment Casting Institute before the Atomic Energy Commission's Sandia Corp., Mr. Dubovick discussed the eight basic factors which influence castability.

ability but lacks widespread use because of its brittleness.

The alloy steels have consistently good castability with some improvement shown by the chromium bearing alloys over the ones with nickel. There is no appreciable difference in castability between the low carbon grades and the medium carbon. The alloys preferred are AISI 3100, 4100, 8600, 8700, and 9300 series as well as AISI 6150. Name brands such as Hy-ten-syl and Timken 17-22A(s) fall in this classification and show good castability.

### STAINLESS STEELS

All of the chromium-nickel alloys possess good castability. This includes the free-machining grades with the selenium bearing alloys slightly better than those employing sulphur for developing free machining characteristics. In this class are types 302, 303, 304, 309, 310, 316, and Armco 17-4PH.

Type 304 ELC occupies a less favorable rating because of its limited carbon range, and types 321 and 347 have a lower rating because of the difficulty in maintaining titanium and columbium, respectively, within specification.

In the 400 series or straight chromium stainless steels, type 420 or 430 have good castability. All alloys in this group have good fluidity. Type 440 has exceptionally good fluidity, and is one of the few ferrous alloys which can be made to fill out areas 1/32" thick.

Because of the high melting point of type 410, and its free-machining counterpart, 416, and a pronounced tendency toward the formation of fine surface pitting, this alloy has a poorer castability than 420 and must be rated as fair. Type 440 is similarly rated for the same reasons.

### FERROUS TOOL STEELS

The tool steels are generally considered as having good castability. The so called non-deforming oil-hardening grades, with carbon from .80 to 1.25, especially when chromium and molybdenum are used as alloying agents, have casting qualities equal to or superior to the low alloy steels.

The air-hardening grades, particularly the 1.50 percent carbon with 5 percent chromium are recommended because of the absence of surface decarburization.

The 12 and 16 percent chromium grades sometimes develop surface pitting similar to type 410 stainless steel. The high speed steel group is rated a little below the other tool steels because of as cast brittleness and the high melting point.

The alloys with cobalt or molybdenum have better castability than the standard 18 W-4 CR-1 V alloy.

### COBALT BASE ALLOYS

This group, as a whole, has the best castability of all the high temperature materials. This applies to the abrasion resisting grades like Stellite, ALX, and Rexalloy 108 which contain 1 to 2½ percent C about 33 percent Cr and up to 22 percent W, as well as the structural alloys such as X-40, Haynes-Stellite 21 with low carbon, 23 to 27 Cr and various other elements making up the difference between the chromium and cobalt. Their excellent castability can be attributed to their melting point which is below 2500 F as compared to type 410 stainless steel with a melting point over 2700 F.

### NICKEL BASE ALLOYS

Castability of the nickel alloys varies from poor to good. Hastelloy C rates equally with stainless steel type 316. Better directional solidification is obtained with Hastelloy C than with the 300 series stainless which enhances its castability. They are susceptible to the formation of heavy oxide scale when solidification is delayed and to hydrogen absorption so that good control must be exercised over the pouring temperature.

All of the nickel base alloys react adversely to high casting temperatures. The temperature control problem is accentuated because low pouring temperatures produce cold shuts. Hastelloy "A" and "B" are rated as fair while Monel has a poor rating.

### SPECIAL PURPOSE ALLOYS

Invar has poor to fair castability, and is susceptible to hot shortness to a great degree.

## INVESTMENT CASTINGS

Nitralloy has poor castability. These nitriding alloys are similar to the AISI medium carbon steels and have good castability if no attempt is made to compensate for loss of aluminum, which they contain, during melting. A tenacious surface oxide, $Al_2O_3$, is formed when aluminum additions are made which leaves heavily pock-marked surface.

Silchrome has good castability. It is a silicon, chromium steel alloy used in the lamp industry because hot glass will not stick to it.

### INVESTMENT CASTING MATERIALS COMPARED TO WROUGHT

Most ferrous alloys which have historically been produced in rolled bars, rods, and sheets are customarily supplied by investment casting foundries to the chemical specifications applicable to the wrought material. The main reason for this is that very frequently parts originally designed for machining are made by investment casting without redesign or without material change.

Further, there are only a limited number of chemical specifications for investment cast metals, and designers in general are much more familiar with the AISI and SAE steel specifications than with the few AMS investment casting specifications or with the ACI and ASTM specifications for sand cast steels.

By careful melting practice and the use of good clean melting stock, investment casting foundries have been successful in maintaining most of the AISI chemical specifications for wrought steel. This has not been without difficulty however.

Producing steel investment castings to wrought bar chemicals has some good and many bad features. The close chemical tolerances do insure a uniform response to heat-treatment and increase the probability of uniform physical properties from casting

*Continued next page*

***"It is now possible to obtain melting stock tailor-made for a particular application . . ."***

**Castability — Cont.**

to casting of the same design. However, it should be recognized that the performance of any particular casting design may be influenced to a great extent by other variables such as:

Suitability of design for casting,

Soundness of the casting with regard to shrinkage and gas porosity,

The solidification pattern in the casting which is influenced by design of both casting and gating and spruing up,

Pouring and mold temperatures which affect as-cast grain size.

These variables frequently influence casting performance far more than composition variations slightly in excess of those allowed by wrought steel specifications. Many foundrymen have found in certain instances radical composition changes may be required to obtain performance in a cast part equivalent to that of the same design fabricated from wrought material.

It should further be recognized that wrought steel specifications were set up to obtain optimum properties compatible with advantageous steel mill practice. Since some of the properties of bar stock are obtained by hot or cold working, castings using the same analysis of material will naturally have inferior properties.

Yet, it is entirely possible to obtain comparable properties with slightly higher alloy content. Since the cost of the metal is usually not a significant item in the final cost of the casting, the user would not be paying any more for this improvement.

Since the problems of the foundry are different from those of the steel mill, it is unfortunate that the foundry must incur extra costs to adhere to specifications which are required for some totally unrelated situation in the wrought steel producing industry. These costs arise in the following manner:

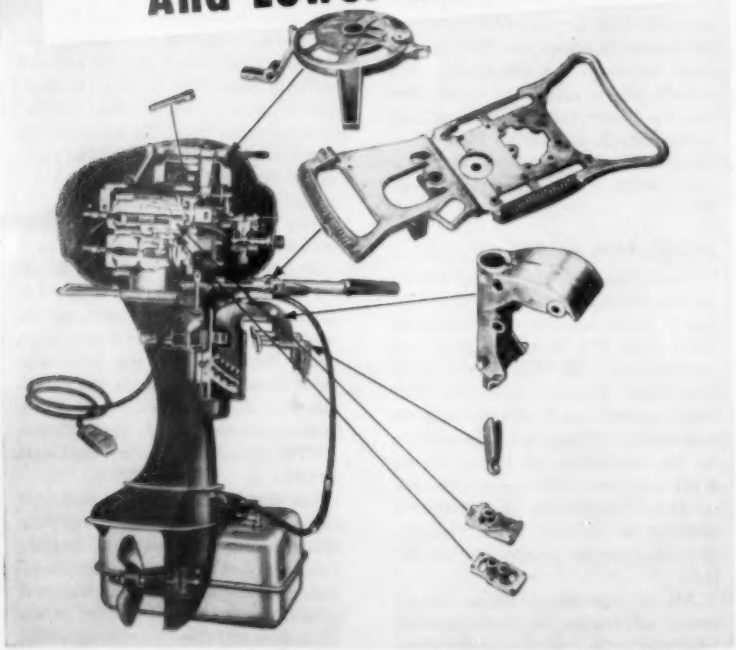
The small heats used mean more analytical cost per pound of metal.

The rejection problem is worse than in the wrought steel industry, because off-analysis castings are total scrap, whereas, an off-analysis heat of steel will usually fall under some other specification and is still salable. Thus, a 4140 heat of steel, which is too low in carbon, can still be sold as 4135 at little or no loss.

The foundrymen are actually prohibited from making composition changes which might improve the quality of their castings and reduce rejections. Thus, the foundry might feel that a particular casting problem could be solved by a silicon addition. However, his freedom in this direction is severely limited, if he is pouring steel to a wrought bar specification.

These added costs, of course, are paid for by the purchaser in the long run, and if adherence to such narrow chemical limits is not necessary, the customer gets less than his money's worth in actual casting value. There is


**More Efficient Production, Better Product Performance And Lower Costs . . .**



**are reasons why SCOTT-ATWATER uses ACCURATE die castings**

■ Because of their uniformity and light weight, ACCURATE die castings greatly reduced the time required for handling and assembly. Cast to close tolerances, they reduced or eliminated machining operations, special tooling and scrap loss. In addition, a more dependable and efficient motor was produced with die castings that have high strength-light weight properties and are non-porous and leakproof.

Perhaps you too, can improve your product and profit picture with ACCURATE die castings. Write, wire or phone if you have a parts problem demanding immediate attention.

ALUMINUM • ZINC • MAGNESIUM DIE CASTINGS

**ACCURATE DIE CASTING CO.**

3089 E. 80th STREET • CLEVELAND 4, OHIO

*For more information circle No. 2 on the Reader Service Card*

considerable opinion in the industry that this is the case and that revised specifications for investment cast steels would be beneficial. The Investment Casting Institute has a committee currently at work on this problem.

Copper and aluminum alloys are ordinarily not investment cast to the same chemical specifications as wrought copper and aluminum but are produced to sand casting specifications which are quite adequate.

In the case of copper alloys, the chemical specifications of the wrought and the cast product may be quite similar. It should be remembered, however, that the tensile strength of the cast metal may be significantly lower if the wrought metal has been cold worked. Thus, in changing a design from a machined part to a cast part, it is essential to specify a casting alloy which will provide a strength comparable to that of the bar stock from which the part was previously machined.

## Availability Of Casting Materials

Procurement of materials for investment casting purposes has been greatly simplified by the establishment of metal supply sources whose primary business is the manufacture of casting materials to the precise analysis required by the investment casting industry. Until these firms were established, material was obtained from local steel warehouses or from the mills in the form of wrought bars. The small melting furnaces generally used limited the size of bar stock which could be used. The bars had to be cut into small pieces which added to their cost and the supplier made an additional charge because of extras due to size. Furthermore, the melting stock had to be purchased with the mill analysis and there was no opportunity to change the chemistry to provide for melting losses. It is now possible to obtain melting stock tailor-made for a particular application within a reasonable length of time at a reasonable price.

Peacetime conditions permit the casting producers to request deviation from alloys containing no critical elements but with inferior castability to good casting grades which usually contain elements whose use is restricted during wartime. The slightly greater cost

*Continued on page 69*

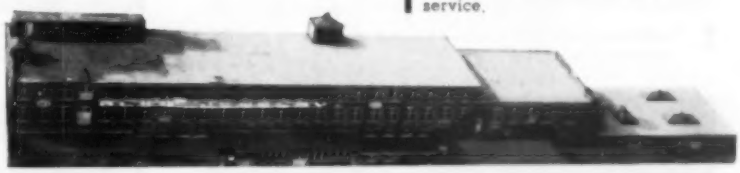
*For more information circle No. 10 on the Reader Service Card*

**ONE PACKAGE**

*From Blueprint to Finished (plated) Casting*

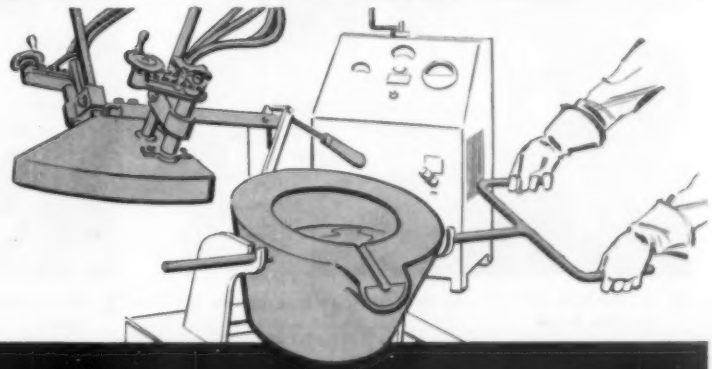
● A complete job from Blueprint to Plating. Our facilities, due to being in a Jewelry Manufacturing Center, enables us to be equipped in our plating department to handle all finishes, including gold, silver, chrome, copper and rhodium plating.

Prompt quotation on your blueprint for our *complete* service.



**R. I. DIE CASTING CO.**

669 ELMWOOD AVENUE • PROVIDENCE 7, R. I.



**15 lb., 12 kw. Pot-Tilting DETROIT ELECTRIC FURNACE**

***—research and small production tool***

A versatile furnace! Converging indirect arc electrodes force arc down over metal for fast melting. Cover lifts and swings aside for charging and pouring. Pot can be transported or tilted to pour from stand. Permanent lining or removable crucibles. Complete with power and meters in separate cabinet.

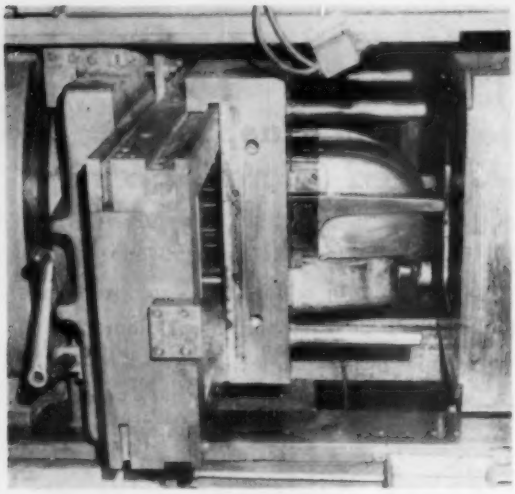
*Write today for complete information on Type PT Detroit Electric Furnace.*

**DETROIT ELECTRIC FURNACE DIVISION**
**KUHLMAN ELECTRIC COMPANY**
**1070 26th St. • BAY CITY, MICHIGAN**

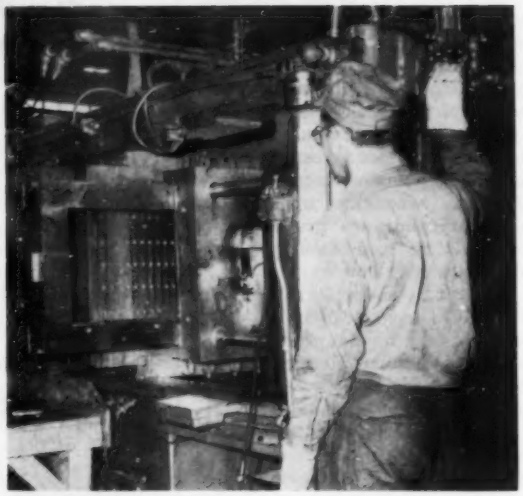
Foreign Representatives: In BRAZIL—Equipamentos Industriais, "Eisa" Ltd., Sao Paulo; CHILE, ARGENTINA, PERU and VENEZUELA: M. Castellvi Inc., 150 Broadway, New York 7, N. Y.; MEXICO: Cia Proveedora de Industrias, Atenas 32-13, Apartado 27A3, Mexico 6, D. F., Mexico; EUROPE, ENGLAND: Birlec, Ltd., Birmingham.

*For more information circle No. 38 on the Reader Service Card*

***When a die casting is deeper than half the die opening . . .***

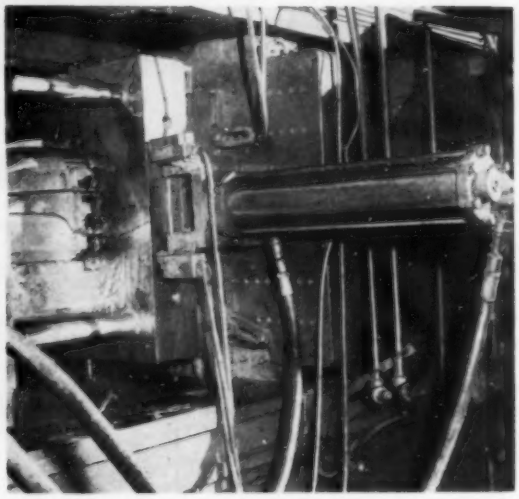


**1.** SHROUD CASTING is shown ejected with ejector pins hydraulically retracted.



**2.** HYDRAULIC VALVE is shifted manually by operator to move sliding core block.

**4.** OPERATOR SPRAYS and inspects large core outside the machine frame.

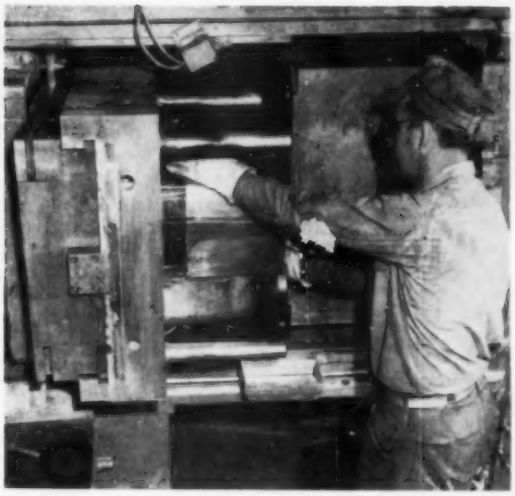


**5.** REAR VIEW shows sliding core block in the ejecting position.

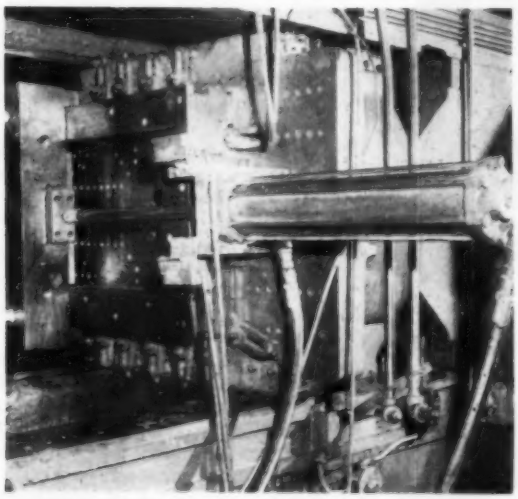
ANY development that can save die casters hundreds of thousands of dollars of capital investment should be brought to the attention of the die casting industry. In setting out to market the 25 horsepower Johnson Outboard Motor we immediately ran into a serious design problem. And in solving it, we believe we've worked out a die design that opens a whole new avenue for future development. With our design, a new dimension is created in a die casting machine which can save enormous amounts of money that otherwise would have to be invested in oversize machinery for casting deep parts.

The problem in die casting the Johnson 25 motor cover was obvious. The over-all height of the part was 13½ inches, but largest machines in the plant had a 16¼ inch die movement. Probably everyone has faced this same situation at one time or another and perhaps has been stymied by it.

In general, people figure on die casting parts with a maximum depth of half the machine opening movement in order to insure clearance for lifting the finished part off the core. The shapes of some parts make it possible to stretch this point by allowing the part to be turned over the core and out of the die space. Or if the casting is open at both ends, part of the core can be built into the cover half of the die to reduce the clearance required for removing the casting. As a result, a deeper part can be cast. Most often, though, the above rule of



**3.** DEEP CASTING is easily removed by operator with core outside the machine.



**6.** CORE BLOCK is disengaged and slides to position outside frame.

# The Problem Of The Deep-Cored Casting... And Its Solution

**Does your supplier of die castings have a limit on depth of castings he can produce with present equipment? This trick of die design may permit him to cast oversize castings without additional capital investment.**

**By J. L. RAYNIAK,** Vice President
Outboard Marine & Manufacturing Co.

thumb is true. Parts deeper than half the die opening stroke are ruled out.

In our case, the height of the casting was so great that it was impossible to remove from the machine.

As the length of the machine increases to give extra die opening and shut height, the beams or bars increase in diameter as well as length. This is necessary when the machine locks to prevent undue deflection and bending. The structure of the machine is thereby increased in cost out of proportion to the benefits in either clamping or die space. It just didn't seem reasonable to buy a mammoth press for a few inches of increased stroke.

A machine capable of casting our cover with a conventional die involved an investment of approximately $80,000, an investment which we felt was unnecessary. Since the shot capacity and shot pressure available were more than sufficient, we felt sure that concentrated ingenuity and a calculated risk would solve the problem.

We might have been tempted at this point to drift into the path of least resistance and buy an oversize die casting machine regardless of our contrary judgment.

Instead we decided to solve the problem more economically and after a number of conferences we came up with an idea that is currently in production and has proved so satisfactory, that we expect it to become a standard

design for deep castings. We are considering the application of the same idea on parts having a depth that does not actually require this special treatment. A number of incidental advantages have resulted which are very attractive to us.

Deep die castings cannot be removed from a standard machine because the cover half of the die obstructs the area in front of the long core. If this area were cleared, the depth of the casting would present no problem at all. It is awkward, if not impossible, to move the cover half because of its rigid connection with the metal cylinder, but there is no such restriction holding the core. And that is how this problem was approached.

We designed a die in which the main core and the block, of which it is a part, can slide sideways in tracks at the top and bottom of a box-like frame. This frame serves as the backing plate, the clamping plate, and legs to allow clearance for the ejector plate to move. Figures 1, 2 and 6 most clearly illustrate the frame and its simple construction. The track and bearing surfaces are all hardened. The core block rolls on several bearings.

Briefly, the operation of the die is as follows:

The die opens, the casting is ejected, and the ejector pins return hydraulically, Figure 1.

The operator slides the core out of the die space by manually shifting a valve to actuate the oil cylinder attached to the core block, Figure 2. The ejector plate is free to disengage the hydraulic ejector of the machine as the core block moves sideways, Figure 6. The core block travel is 22 inches in this die.

With the core block outside the die space, the 4 lb. casting is removed, Figure 3, by the operator and the core is inspected and sprayed with lubricant. In this position the operator can examine the core thoroughly and comfortably. The operator returns the core block. The ejector plate, moving with the core block, engages the hydraulic ejector of the machine.

In its return position, the core block makes the safety switch, Figure 5, allowing the die to close. The leader pins guide the die halves as usual.

The shot is made normally and the die opens again at the end of the machine cycle, ejecting the casting.

We had a number of doubts when we started, but these proved to be unfounded. The die has been in production since June, 1954 and production from it has been consistent and uninterrupted. The rate is not yet at its maximum because there are some manual control operations which can be made automatic. And the oil lines to the core block cylinder can be increased for increased speed of movement.

The operator's work is not only more convenient, but actually safer. With the core block directly in front of him the casting is easily removed, and the operator's arms are never exposed between the machine platens.

The die itself has operated with no more than ordinary maintenance. As an answer to our problem, we feel it has been excellent. We understand that this same technique has been used in compression and injection molding. Considering the fact that a die casting machine is exposed to

IN THE WEST IT'S . . .

UNIVERSAL
Die Castings

*Preferred* when only the best is good enough

When you buy your die castings from Universal, you are gaining the services of experienced die casting engineers, die designers, production men and management. You are putting a well-equipped shop to work on your castings. You will find, as hundreds of other companies have, that you can depend upon Universal for quality, service, delivery and prices that will help keep your own production costs down.

*We Specialize In Brass Die Castings.*

UNIVERSAL
DIE CASTING COMPANY

5001-05 Santa Fe Ave. • Los Angeles 58, Cal. • Phone Kimball 7264

*For more information circle No. 62 on the Reader Service Card*

metallic grit and sprayed lubricants, the plastic machines are actually an easier application and this technique is even more appropriate for their use.

The slides of the die are hardened and the core block bears on several bearings. Our part had a straight draw, but this design isn't limited in this respect. Core-pulling cylinders that do not extend above the beams or bars can be mounted on the sliding core block. Core-pulls can be used on the cover die in the conventional way.

The die was quoted to us as a conventional die and also as it was finally built. Our die design was approximately 10 per cent higher than the conventional design. The die maker was Schultz Tool & Die in Chicago. The part runs on one of our 750 ton Lester machines with prefill injection.

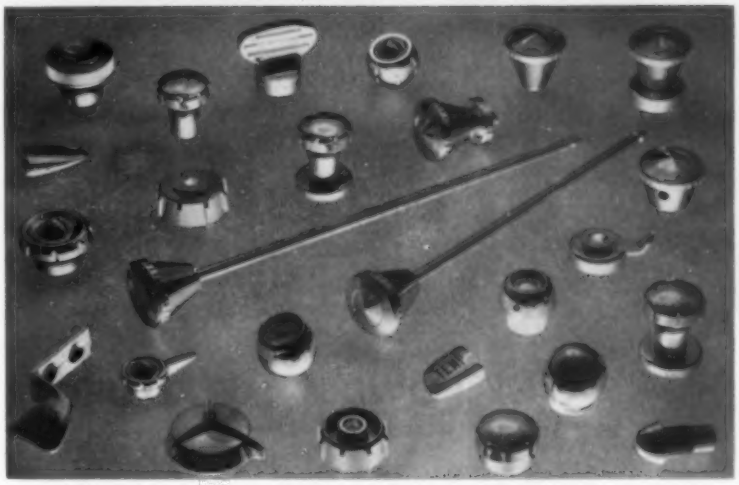
### CARL F. MAYER, SR. DIES

Carl F. Mayer, Sr., president and founder of the Carl Mayer Corp., Cleveland, Ohio, passed away suddenly April 20.

He will be succeeded as president by his son Carl Mayer, Jr. who has been vice-president and general manager of the company since 1951.


For more information circle No. 49 on the Reader Service Card

ZINC AND ALUMINUM DIE CASTING
by NELSON METAL PRODUCTS, INC.



*An example of a few knobs and assemblies that we supply for the automotive, appliance, and hardware trade*

"QUALITY—DELIVERY—PRICE"

**Nelson metal products, inc.**

510 32nd St., S.E. GRAND RAPIDS 8, MICHIGAN

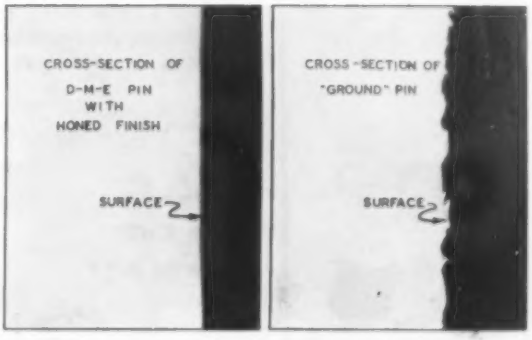
*Another Reason Why . . .* DME **EJECTOR PINS** *are the Finest Made*

# HONED FINISH

**REDUCES WEAR and MOLD FLASH**

D-M-E Ejector Pins are hot-forged, precision ground, nitrided and THEN HONED . . . to give you the finest finish possible. The photo-micrographs shown here illustrate clearly the result of this added D-M-E feature.

Under magnification of 500 X the so-called "ground" finish pins reveal a saw-like surface which gradually opens up the hole surrounding the ejector pins and eventually causes mold flash. D-M-E's "honed" Ejector Pins, under the same magnification, reveal a smooth finish which reduces wear and costly down time.

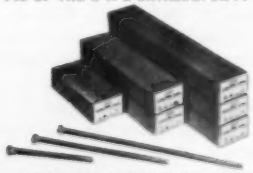



*The above photo-micrographs were made in an impartial test by the Detroit Testing Laboratory, Inc. of Detroit, Michigan.*

**42 Standard Diameters from 1/16" to 3/4"**

**IMMEDIATE DELIVERY . . . 5 BRANCHES**

COMPLETE DATA ON PAGE 142 AND 143 OF THE D-M-E CATALOG. OR . .

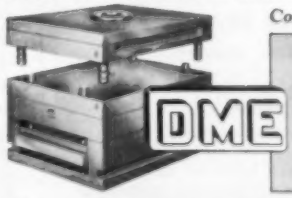


. . WRITE TODAY FOR THE 8 PAGE EJECTOR PIN DATA FILE!

## DETROIT MOLD ENGINEERING CO.

6686 E. McNICHOLS ROAD — DETROIT 12, MICHIGAN — TWinbrook 1-1300

*Contact Your Nearest Branch FOR FASTER DELIVERIES!*




HILLSIDE, N. J. (NEAR NEWARK) 1217 CENTRAL AVE., ELIZABETH 3-5840
CHICAGO 51, ILLINOIS 5901 W. DIVISION STREET, COLUMBUS 1-7855
CLEVELAND 14, O.—D-M-E CORP. 5473 LAKE CT., ENDICOTT 1-0907
LOS ANGELES 7, CAL. 3700 SOUTH MAIN STREET, ADAMS 3-0214

2355

For more information circle No. 22 on the Reader Service Card

WHY POWDER METALLURGY?
... Because Powder Metallurgy is the speedy, lower cost method of producing small metal parts with blueprint accuracy.
Parts may be so pressed and sintered that costly machining is eliminated or simplified.
Parts can be produced to close tolerances. For economy, there's no wasted metal—since die overflow powder can be reused.
WHY MD METAL POWDERS?
. . . Because nearly forty years of research and manufacturing experience have made MD the Headquarters for highest quality Metal Powders for every Powder Metallurgy need.
MD, the pioneer Metal Powder producer, is the only company producing a complete line of powders of such a wide range of metals and their alloys.
Remember
One Call
Does It All!
METAL POWDERS
METAL PIGMENTS
METAL ABRASIVES
METALS DISINTEGRATING COMPANY, INC.
Elizabeth B, New Jersey
Plants:
Elizabeth, N. J.; Manchester, N. H.;
Berkeley, Calif.; Emeryville, Calif.
SUBSIDIARY OF AMERICAN-MARIETTA COMPANY

## STANDARDIZATION, FLUIDS AND DESIGN HIGHLIGHT HYDRAULICS CONFERENCE

Discussions of standardization of hydraulic components, a new type of fire resistant fluid and how to design and build for leakproof connections in hydraulically actuated equipment highlighted the Fabricating Machinery Hydraulic Conference held recently in Detroit under the sponsorship of Vickers Inc.

The conference was attended by nearly 150 design, maintenance and service engineers representing 88 manufacturers and users of metalforming machinery, die casting equipment, presses, welding machinery and plastics injection molding equipment and 15 suppliers of hydraulic components and materials.

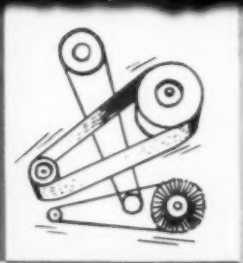
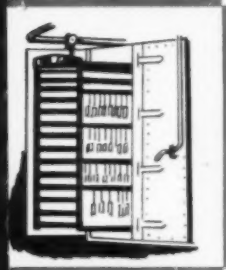
Keynote speaker was D. J. Davis, vice president—manufacturing of Ford Motor Company, who discussed the increasingly important role being played by hydraulics in industry. Co-moderators for the two-day meeting were Royal E. Russell, master mechanic of Chrysler Corporation's 9 Mile Road press plant in Detroit, and Adolphe J. de Matteo, chief engineer for Watson-Stillman Company Division of H. K. Porter Company, Inc. in Roselle, New Jersey.

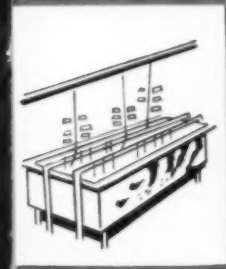
*Standardization of hydraulic components* for fabricating machinery: The need for interchangeability with regard to size and location of ports as well as mounting pad configurations and dimensions was brought out. It was noted that while no large-scale trend toward standardization is currently in evidence, the subject is being given serious consideration by suppliers.

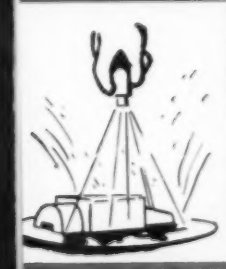
*Hydraulic fluids:* Although experimental results are still inconclusive, present indications are that the new water soluble fire-resistant fluids (oil-in-water and water-in-oil emulsions) will probably be limited in their application to working pressures below 300 psi to insure satisfactory performance.

A highlight was the first public announcement that a leading auto manufacturer has taken the initiative in establishing standards of dimensions, tolerances and construction features for the manufacture of oil-hydraulic cylinders. This program, begun 1½ years ago, is aimed at improving cylinder life as well as producing dimensional interchangeability.

For more information circle No. 75 on the Reader Service Card





# PMM

# Finishing Section

**Finishing includes all secondary operations performed on precision metal molded parts — up to and including final surface treatment. This section presents new information about the specialized methods, equipment and materials needed for finish-machining, assembly, surface preparation and final finishing of all precision metal molded parts.**

devoted to the specialized problems of finishing . . .

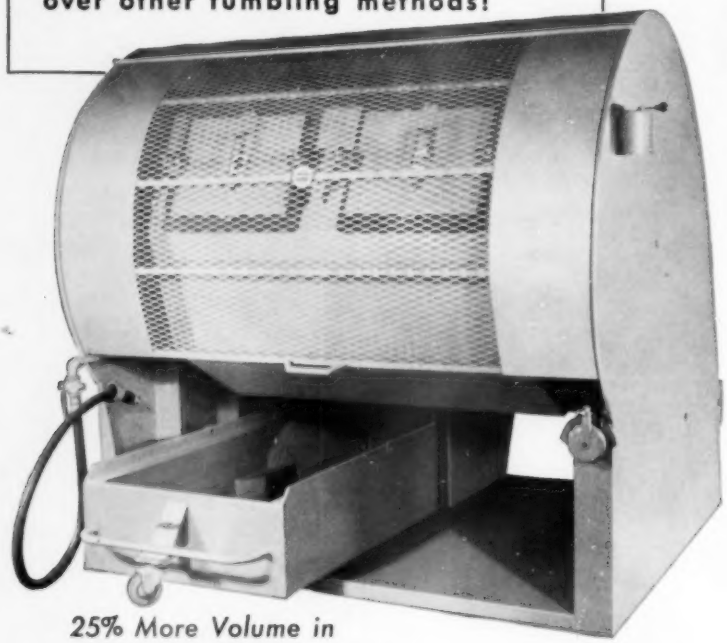
DIE CASTINGS • INVESTMENT CASTINGS • PERMANENT MOLD CASTINGS • PLASTER MOLD CASTINGS • POWDER METAL PARTS • SHELL MOLD CASTINGS

# 25% FASTER TUMBLING

**Equipment and materials combined to increase direct-labor savings over other tumbling methods!**

**with**

**TUMBLE GRAV-I-FLO FINISH**



*25% More Volume in 30% Less Floor Space!*

MODEL 48"
Two Compartments

**than comparable machines.**

Grav-i-Flo's larger capacity plus improved cutting and finishing materials slash processing time—no need for transferring parts from cylinder between roughing and finishing. Get speed *and* smoother surface, higher lustre by asking for a Grav-i-Flo representative to visit your plant, or by sending us samples.

***SEND FOR CATALOG*** showing complete line of Grav-i-Flo equipment, accessories and supplies.

Grav-i-Flo Corp., Dept. PMM-7, Sturgis, Mich.
☐ Send complete catalog. ☐ Have Sales Engineer Call.
☐ We are sending samples.

Company _____
Name _____ Position _____
City _____ State _____

**GRAV-I-FLO CORPORATION,** 400 Norwood Avenue, Sturgis, Michigan

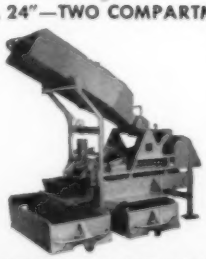
**COMPLETE EQUIPMENT, ACCESSORIES AND SUPPLIES**

MODEL 66"—TWO COMPARTMENTS

MODEL 36"—TWO COMPARTMENTS

MODEL 32"—TWO COMPARTMENTS

MODEL 24"—TWO COMPARTMENTS



CHIP SEPARATOR AND GRADER

*For more information circle No. 66 on the Reader Service Card*

In finishing die castings
and other non-ferrous castings

# Get The Most Out Of Your Abrasive Belts

ABRASIVE BELTS are widely used in casting preparation. Above: contour blending a die cast aluminum vacuum cleaner part prior to buffing; Below: polishing die cast zinc plumbing fitting prior to plating.

**By L. H. VORCE**
Product Engineer,
Mid-Western Region
Behr-Manning Division, Norton Co.
(As told to a **PMM** editor in an exclusive interview)

**PMM** For what types of jobs on non-ferrous die castings, permanent mold castings and investment castings is modern coated abrasive belt polishing most commonly used?

**A.** Coated abrasive belts are most commonly used on such castings for removing and blending of flash, for the spot polishing of chill marks, and the grinding of flats.

**PMM** What type of belt and grit size do you recommend for flash removal and contour work?

**A.** While the type of belt used depends on the condition and size of flash, we recommend in general a resin-over-glue cloth-backed aluminum oxide or silicon carbide belt of J (Jeans) weight. Silicon carbide is preferred nowadays in the interest of easier and faster buffing after polishing. It provides a more uniform finish without drag or crowsfoot marks. J-weight provides a light and flexible backing which is ideal for radius, concave or convex work. In fact, because of the prevalence of radius and contour work it would be good sense for a finisher of die castings to stick to the J weight, double-flexed belt rather than to have to stock both the stiffer X (drills) weight belts and the J weight belts. Grit sizes of 220, 240 or 280 will handle most of the finishing jobs encountered. If stock removal is heavy, coarser grit belts should be used.

**PMM** What do you do about grinding and polishing hard-to-get-at places?

**A.** The use of a "free belt" is recommended here. The belt is usually driven by a crowned, rubber covered drive pulley over an idler equipped with a spring tensioning device. The work is presented to the belt between the pulleys. The valleys of "J-traps" for the plumbing industry are finished by this method and practically all modern automobile horn rings are finished with free belts.

***Abrasive Belt Machines***
***Do's and Dont's***
***Typical Finishing Jobs***

## *Typical finishing jobs with abrasive belts . . .*

CONTOUR BLENDING is one of the most common finishing jobs on die castings.

FLAT SURFACING with platen machine prepares surface for gasket or assembling.

CLEANUP OF CONCAVE edges is easily done freehand with simple yoke sander.

EDGE CLEANUP to remove flash roots left after trimming is often necessary.

**PMM** How about contact wheels and lubrication procedure?

**A.** Convex areas and concave areas are always applications for a soft type of contact wheel, either a sectional or a finger type of cloth wheel to conform to the radii. In the case of approximate flats or flash on an edge we generally recommend a plain-face 30 durometer (medium density) rubber type contact wheel for a more even blend on a flat surface than you can get with the softer wheels.

As the density of the contact wheel is increased, cutting action becomes faster and the finish becomes sharper. For tolerance flats, as at gasketed or flanged faces, platen type machines (no contact wheel at all) are used. Hard, flat platens behind wide belts insure truly flat work.

All dry coated abrasive belts should be lubricated with a low melting point grease to provide a high luster and better blend of the finish before buffing, and also to prevent loading.

**PMM** Can coated abrasive belts handle the more complex contour jobs?

**We asked Mr. Vorce for recommended Do's and Dont's. Here is his list . . .**

### DO

1. Consult your coated abrasive source for testing help and for time saving methods — as well as for the usual belt, grit and wheel recommendations.

2. Make sure that the finish obtained is carried to the point that the buffing prior to plating is easy. This reduces rejects and minimizes costly buffing time.

3. Provide for proper handling of parts before and after polishing to eliminate needless damage and rejects. Paper interlayers or compartmented trays alone will provide excellent parts protection in handling before plating. It costs money to provide a good finish. Protect the investment.

4. Provide proper inspection of pieces after buffing and before plating to eliminate the necessity of stripping the plate on parts which require re-work.

### DON'T

1. Don't take a chance on running up rejects because of wheel and wild grain marks caused by improper use of setup wheels. Belt polishing eliminates this hazard and provides uniformity of finish.

2. Test both aluminum oxide and silicon carbide to fit your finishing recommendations. Resinized (resin-over-glue) belts do cut faster but do not produce finishes which buff out as fast as those produced on glue-bonded belts.

3. Avoid the use of heavier types of greases on belts to prevent belt loading.

4. Do not use *just any compound*. Employ the services of the many compound and buff sources available for the proper information.

5. Do not fail to use enough of the lighter (wet) type grease on belts. Otherwise, small drag marks will appear and show up in buffing before plating — particularly with zinc die castings. This fault is commonly blamed on the belt, but is really a fault of lubrication. Should the belt load up with grease as the result of over-lubrication to be on the safe side, the grease is easily removed with an oil now available to the trade in a pressurized can for this purpose.

**A.** Yes. At one time the use of coated abrasive belts was limited to straight-faced wheel operations, but since the advent of flexible belts a wide range of contour operations can be handled easily. Ingenious equipment development has also extended the applicability of abrasive belts to this type of work.

**PMM** What range of speeds do you suggest for best performance?

**A.** Speeds of from 5000 to 7000 surface feet per minute should be maintained for best results and the longest belt life.

**PMM** What kind of production rates can be accomplished with offhand grinding and polishing?

**A.** It is now obvious that hand polishing with belts by the backstand method is faster than the conventional setup wheel practice because of the improved cutting action. With a resin-over-glue type of belt and using grease, loading is less rapid than with the older glue bond belt. Production rates vary widely and would have to be established with each individual part. However, because of the slower cut and the longer downtime involved with setup wheels, especially under humid conditions, the coated abrasive belt is a faster and more versatile tool.

**PMM** How about the degree of precision which can be obtained with coated abrasive belts?

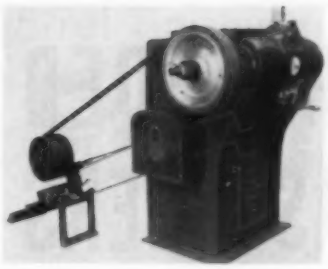
**A.** When low tolerances are required, coated abrasive belts under the proper conditions can consistently maintain tolerances as low as $\pm 0.001$ to $+0.002$ inches. With fine grit belts it is possible to obtain surface finishes down to 3 to 4 micro-inch.

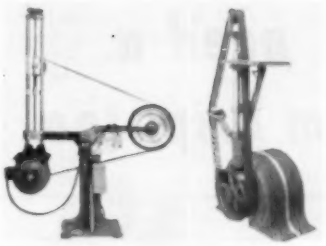
**PMM** What types of machines are most widely used in grinding and polishing castings with coated abrasive belts?

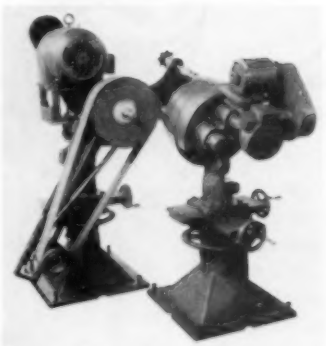
**A.** About 90 percent of the general run of die castings is done on polishing jacks or lathes, using the wheels described above and using a backstand behind the lathe for maximum stock removal.

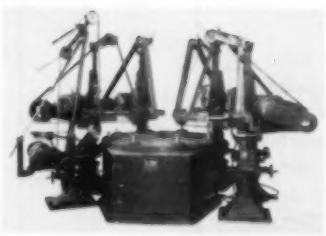
In some cases, smaller types of unit-frame machines or yoke sanders are advantageous for getting into small holes or slots, or

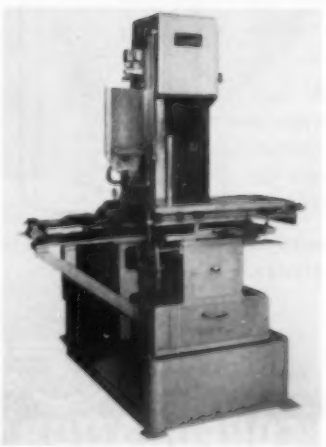
*Continued on page 55*











**The five basic types of coated-abrasive-belt machines most used by die casting finishers**

The classic ***jack-and-backstand*** — for offhand work against contact wheels of great variety (soft, hard, flat, contoured, wide, narrow). Backstands (also in great variety, this one is spring-tensioned) should be floor mounted. Spindles of jacks (lathes) are often adjustable for speed.

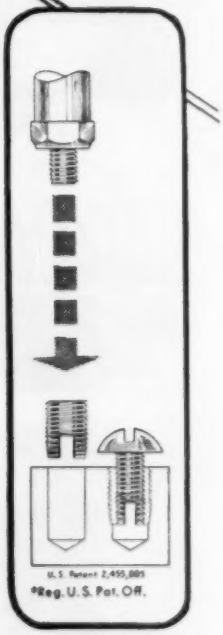
Two ***unit-frame machines*** — also for offhand work. (L)—for seated operation with elbows on knees, and contact wheel support such that no wrenches are needed for changes and workpieces can extend beyond center line on either side of wheel. (R)—yoke type with very small contact wheel (top)—here shown with table attachment (least used position). Generally, table is omitted and tension arm is tilted toward operator so small wheel and yoke address the piece—or actually extend through work to finish inside circumferences.

The popular ***semi-automatic setup***—for production work. The belt head (at left) and/or the indexing work fixture (at right) may be articulated on "universal stands", both being so mounted in this view. The ferris-wheel fixture is motorized to rotate the workpiece during polishing and index a sequence of parts into polishing position.

A true ***rotary automatic*** with many polishing stations (six in this case)—for high production work. Loading and unloading are at the two empty stations in the foreground.

A typical ***platen machine*** for polishing mating, gasketed or tolerance flats —the wide abrasive belt passing over a steel platen in the working zone. Notice table adjustments for close tolerance work, and cylinder (at left) for oscillating work back and forth across belt. Belt used either wet or dry.

# THREADED FASTENERS need a firm grip, too!




Do you use aluminum, magnesium, plastics or other non-ferrous material in your product? If you do, some sort of hard bushing is necessary to strengthen tapped threads. The best of all such bushings, from the standpoint of time, labor, cost, and service is the Tap-Lok* Insert.

Tap-Lok Inserts are easily installed with a simple driving tool or standard attachment for a drill press. Their resistance to torque and pull is limited only by the strength of companion parts. Simply tap them into a drilled or cored hole equal in size to a tap drill hole for the external thread. Slotted segments provide cutting edges that tap their own threads. Internal threads receive male threaded member.

Tap-Lok Inserts require no separate tapping, hole preparation or secondary operations. They eliminate danger of cross-threading, rejects and pull-outs, and overcome the troublesome failures of molded inserts.

Tap-Lok Inserts have wide acceptance in original equipment, production salvage, and maintenance.

***Send for descriptive folder.***

GROOV-PIN

Also manufacturers of Groov-Pins for positive locking press fit.

**GROOV-PIN CORPORATION**

1122 Hendricks Causeway Ridgefield, New Jersey

*For more information circle No. 67 on the Reader Service Card*


ABRASIVE BELTS
continued from page 53

for edge deburring. These machines, having motor, contact wheel and idler wheel mounted on a single base is often recommended where a shop does not already have spindle power available, and where a substantial amount of intricate grinding and polishing is involved.

Some of these units use small belts (two inches wide or less) over small diameter (¾ to four-inch) contact wheels and are very useful for fitting into small openings, recesses and other areas often designed into die castings.

**PMM** Is the type of work encountered in grinding and polishing these types of castings likely to be done either by offhand polishing or by rotary automatics and semi-automatic machines?

**A.** Shops use all three methods, depending on the shape of the product, the grinding job to be done and the volume of products involved. With some shops it is either a case of buying the higher production equipment or settling for a larger finish cost per piece with hand polish.

At one automotive die casting plant the shape of the cast part determines whether hand polish, semi-automatics or automatics are to be used. Here the decision is based upon the ease or difficulty of part manipulation during polishing.

**PMM** What do you recommend to assure good tracking over soft, contour contact wheels?

**A.** I don't believe we can emphasize too often that a much better job of tracking belts over narrow, soft wheels and shaped wheels can be done with the idlers mounted near the floor. This type of set-up has the great advantage of more belt "wrap-around" (100 deg. plus) on the contact wheel prior to contact between the workpiece and the belt. This prevents belt side travel due to collapse of the edge of the wheel. Wherever possible, belts should travel down and away from the point where grinding is done . . . for finishing work.

*Continued on page 71*

## HONITE Barrel Finishing Produces

# Superfine Sanitary Finish!

Cherry-Burrell Corporation, Milwaukee Division, made large savings when they switched to the HONITE Barrel Finishing Method, *and* actually improved the sanitary finish necessary on their line of food processing equipment.

The milk filler tank shown below was formerly finished in two hand operations—grinding to remove weld splatter and generally improve the surface, and polishing to bring the surface down to 15 R.M.S. Recently, Methods Engineer, Ralph Wenger, supervised a change to the HONITE Barrel Finishing Method.

Results? The recommended HONITE procedure eliminated the polishing operation completely, and 60% of the rough grinding hand operation. Finishing time was cut 1½ hours . . . and finishes were improved to a superfine finish.

Your HONITE Methods Engineer or nearby HONITE distributor will show you how *you* can increase production and cut costs, too. Call him today!

Remember, too, the HONITE Division of the 3M Company supplies a *complete line* of abrasive chips, compounds and equipment for every barrel finishing need.

**CHERRY-BURRELL METHODS ENGINEER,** Ralph Wenger, holds a 40 lb. stainless steel milk filler tank. HONITE Barrel Finishing Method produced its superfine finish.

Honite BRAND

**IT'S NEW!**

Made in U.S.A. by Minnesota Mining and Mfg. Co., General Offices: St. Paul 6, Minn. In Canada: P. O. Box 757, London, Ontario. Export Sales Office: 99 Park Ave., New York City. Makers of "SCOTCH" Pressure-Sensitive Tapes, "SCOTCH" Brand Magnetic Tape, "3M" Adhesives, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing.

MINNESOTA MINING AND MFG. CO.
DEPT. FF-75, ST. PAUL 6, MINN.

☐ *Send me FREE copy of "Facts and Figures Report on HONITE Barrel Finishing"*

☐ *I'd like to talk with a HONITE Field Engineer*

*Name* ..... *Title* .....

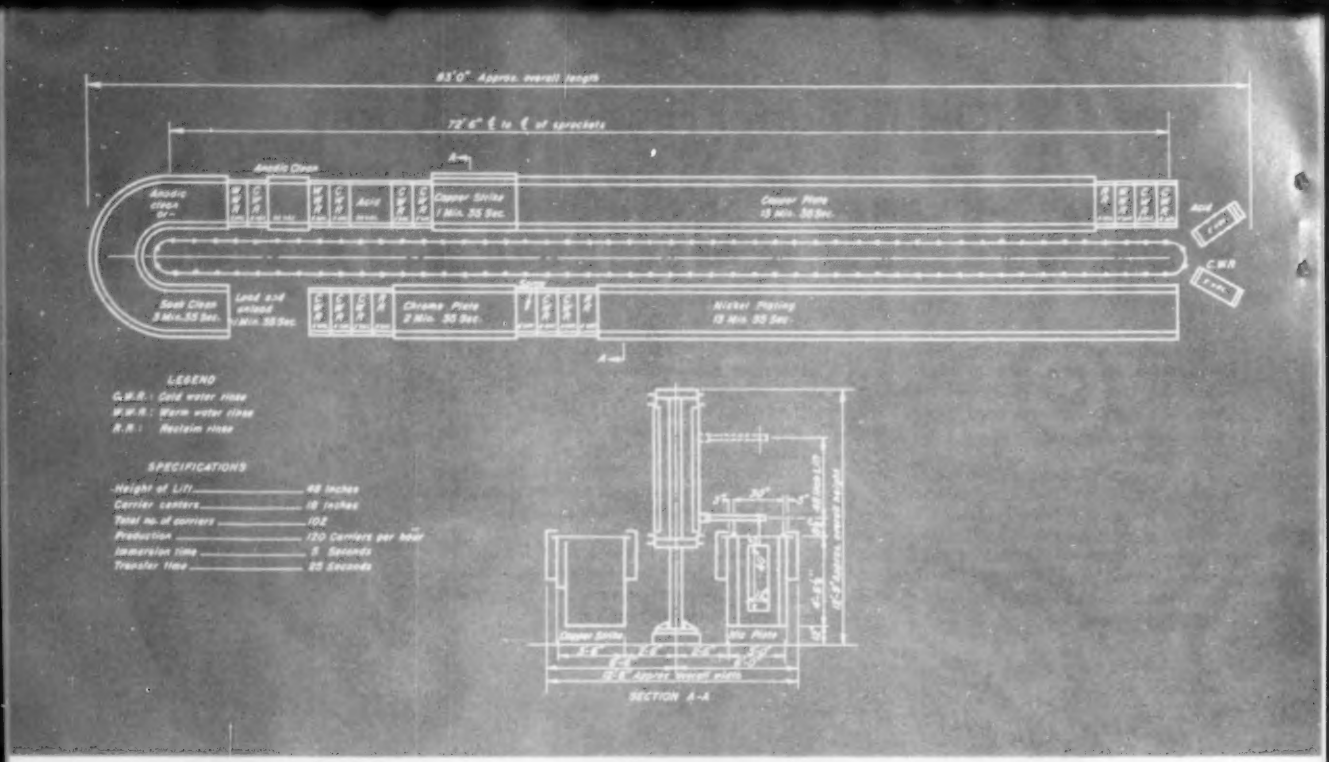
*Company* .....

*Address* .....

*City* ..... *Zone* ... *State* .....

*Type of product to be finished* .....

***For more information circle No. 68 on the Reader Service Card***




## 1. How automatic plating works . . .

*Racking:* Parts that have been polished, buffed and degreased are placed on the plating racks as they travel along on the overhead auxiliary conveyor. Up to four girls work at the racking station and load 95 racks per hour. A rack holds up to 60 small pieces and eight to 16 refrigerator handles.

*Automatic loading:* Racks pass from the racking station to the 85-ton plating conveyor where they are automatically transferred from the auxiliary conveyor.

*Plating:* The successive steps in plating and times for each stage are depicted above. The racks travel clockwise, and typical total times are copper plating 20 min. 45 sec.; nickel plating 14 min.; and chromium plating 3 min.

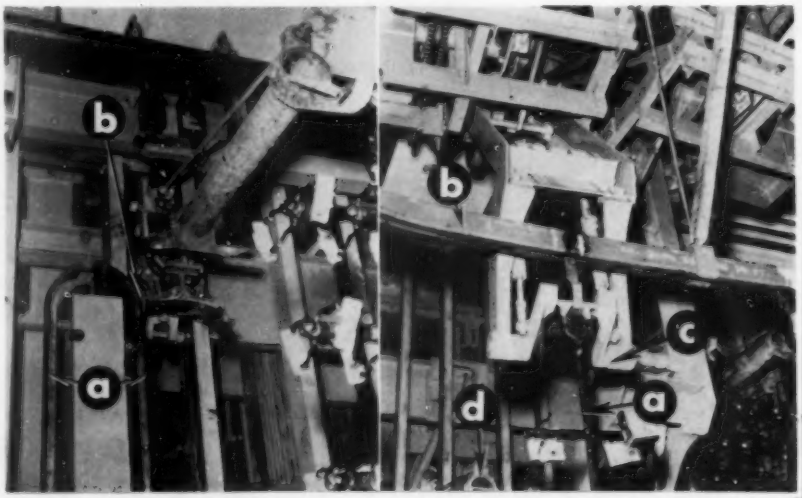
*Unloading:* After chromium plating, racks travel two station stops and are automatically transferred back to the auxiliary conveyor. The load and unload stations are 18" apart.

*Post-plating:* Racks are now conveyed through a water-spray bath. After this final rinsing, racks pass through a drying oven, receiving blasts of hot air. Oven temperature is between 180° F to 200° F

Parts are unracked while the racks remain on the monorail conveyor. The racks are subsequently stripped, washed, dried and returned to the racking station.

Supplying current for the electrolytic cleaning baths is a 6,000-amp H-VW-M generator. A 7,500-amp unit supplies the copper, nickel and chromium plating baths. Generators are located in a separate room above the installation. Air is first filtered before entering the room.

To remove fumes from the various processing tanks, an exhaust system was devised that removes 51,000 cubic feet of air per minute, or the equivalent of six air changes per minute.




**2.** CURRENT-ON IMMERSION, left, is provided by these cathode rails (a) mounted on supports from the framework of the plating conveyor. Collector fingers (b) of the individual carrier arms are shown engaging the rail as it descends into the tank.

**3.** AUTOMATIC LOADING, center. Rack (a) is shown being taken from the auxiliary chain conveyor (b) by the loading mechanism (c). It will be loaded on the carrier arm of the plating machine.

**4.** MECHANISMS for automatic loading and unloading are viewed from the plating conveyor, right.

# Automatic Plating Boosts Production On Die Cast Refrigerator Hardware

By LEONARD E. WEEG
Superintendent of Finishing Division
National Lock Company

A new giant $300,000 automatic installation for copper, nickel and chrome plating hardware products, Figure 1, was recently set in operation at the National Lock Co., Rockford, Ill.

Engineering features of the installation, whose plating conveyor was built by Hanson-Van Winkle-Munning Co., include automatic conveying, automatic loading and unloading, automatic bypassing, automatic stripping, and a safety device that enables an operator to bring moving equipment to a halt from any place on the plating machine. The plating machine, referred to by personnel in the plant as "Big Bertha," covers an area of 3,000 square feet.

Parts of varied design and size are plated on the new machine. Most parts consist of zinc alloy die cast refrigerator hardware products, of which the company is a leading manufacturer. Others include cabinet and stove hardware, and various types of furniture trim.

National Lock is currently operating on a 24-hour basis and turning out over 200,000 pieces of work on the new machine each month. A higher quality plating has been achieved, especially with the larger pieces of work. Current distribution has been improved, and better coverage in recessed areas achieved. Less metal is being used now, and less touching up by hand is being done. All in all, plating is now being performed at lower cost.

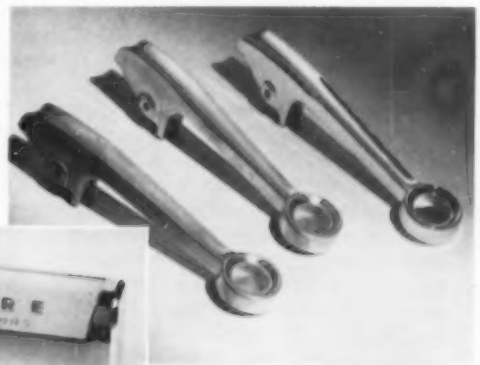
Refrigerator parts, particularly in recent years, have become much larger—to such an extent that plating tanks were having difficulty handling the larger sizes.

Some parts are made of sheet steel. Some of these must be painted as well as plated. Other parts require only copper plating —sheet steel stove handles, for example. Still others require a satin chrome finish which necessitates brushing after copper and nickel plating.

## How Production Was Boosted

**1.** *Automatic Conveying:* The copper, nickel and chromium plating operations are carried out automatically. The full-automatic return-type machine can perform all three plating operations in sequence, any two of the three, or simply any one of the three. With the conveyor, plating cycles and immersion times may be simply and easily varied and controlled. Changes, for example, are made several times in a typical day.

Do frequent changeovers slow down production? Not if they can



**5.** THESE PLATED PARTS are typical of work done on the automatic machine. National Lock plates more than 2,500 different parts, mostly die cast zinc refrigerator hardware.

*Advertisement*

# A SPECIAL REPORT ON PROTECTIVE FINISHES FOR ALUMINUM

## Most aluminum producers and fabricators are well aware of the superiority of chemical finishes over anodizing for the protection of aluminum from corrosion. Naturally, then, there is a running battle for acceptance among the leading producers of the protective chemical finishes.

That's why, here at Allied, we have always studied your needs with regard to both our own and competitive processes. We're constantly trying to produce new and better finishes because we believe there's always room for improvement . . . even to our own products. Some years ago this policy led to the introduction of a process, long in development, that offered you a way to overcome anodizing's obvious technical complications . . . Iridite #14. This finish was far easier to use than anodizing, yet provided comparable, if not superior, quality. And, its cost was much less than anodizing.

But other finishes offering similar advantages over anodizing have entered the market. So . . . the current battle for acceptance. By any cost comparison Iridite #14 is the most economical. However, corrosion tests by users show contradictory results as to performance from Iridite #14 and other leading protective finishes for aluminum. Most tests show Iridite #14 superior, but some do not. The margin of difference, however, is always small. The truth is that all have proved good. However, our laboratory research indicated that still further improvements could be made.

That knowledge . . . plus our aim to give you even better protection and maintain the leadership of the industry, is exactly why Allied Development Engineers have been working for long years to develop a better finish than any of those now available, including our own Iridite #14.

Now the new finish is ready for you. It's called Iridite #14-2 (Al-Coat).

From a performance standpoint, Iridite #14-2 gives you two important advantages in the protective finishing of aluminum.

**FIRST: in its fully colored brown film stage it provides corrosion resistance decidedly superior to previous processes.**

**SECOND: the basic brown film can be hot water bleached to produce a clear-type film with protection heretofore unobtainable from clear-type chemical finishes.**

From an operating standpoint, new Iridite #14-2 gives you three important advantages.

**FIRST: it provides consistently higher corrosion resistance for different aluminum alloys treated in the same bath.**

**SECOND: it provides a more uniform appearance for parts of different alloys and with varied surface finishes before treatment.**

**THIRD: its operating and technical characteristics are superior to those of other processes.**

If you are using or planning to use a chemical finish for aluminum, you should have full details on new Iridite #14-2. Write us or send samples for free test processing. Or, for more immediate advice, call your Iridite Field Engineer. He's listed under "Plating Supplies" in your classified telephone book. - - - ALLIED RESEARCH PRODUCTS, INC., 4004-06 EAST MONUMENT STREET, BALTIMORE 5, MARYLAND.

P. S. Even new Iridite #14-2 will be constantly measured against both your needs and competitive processes to make sure you get the best possible, most economical finish for your product that man and the laboratory can develop.

*For more information circle No. 64 on the Reader Service Card*

be made rapidly. The new machine has increased plating capacity up to 150 percent, and is turning out between 7,000 and 20,000 plated parts per 8-hour shift.

2. *Automatic Loading and Unloading:* Automatic transfer mechanisms load and unload racks on the plating conveyor, Figures 4 and 5. One operator would normally be required to perform the same operation, which means a saving of several thousand dollars annually.

The loading and unloading mechanisms, which are similar in design, are located alongside each other between the end of the chromium plating line and the beginning of the copper plating cycle, Figure 1. Actuated by chain drives, they move reciprocally between the plating machine and an auxiliary conveyor.

They are synchronized to load and unload racks while the carrier arms of the plating conveyor are in a dwell or down position. Speeds of the two conveyors are so regulated, and loading and unloading so sequenced, that a rack is delivered to the plating conveyor and one taken from the same machine every 38 seconds during the normal cycle.

3. *Automatic Bypassing:* With the elevator-type plating conveyor, cathodic cleaning, anodic cleaning, the copper strike, copper plating and the acid dip, nickel plating and chromium plating operations are set up for bypassing.

Bypassing is accomplished when individual carrier arms stay aloft over the "bypass" tank, and continue their forward movement around the conveyor in the usual manner. Actuating the bypassing movement is a flipper mechanism located at the bypass tank. Manually positioned, it contacts a roller on the carrier arm. The arm then stays aloft during the normal lowering cycle.

4. *Automatic Stripping:* The plating of copper-nickel-chromium is done without reracking. Frequently work is reracked after nickel plating in order that racks used for copper and nickel plating might not be used for chromium plating, and vice versa. Reason: small quantities of chromium plated-out near the contact points of the rack can contaminate the copper and nickel solutions.

The problem of possible contamination has been overcome by electrolytically stripping the racks of chromium following the unracking of the plated parts. The operation is performed automatically. Reracking would require the efforts of from four to six workers—all of which amounts to over $16,000 a year.

## How Quality Finish Is Achieved

1. *Thorough Rinsing:* National Lock has been able to practically eliminate the possibility of staining by introducing three rinses after chromium plating, besides a reclaim rinse. Parts are then subjected to a final rinse of deionized water in a spray cabinet while on the auxiliary conveyor, and subsequently hot-air dried.

2. *Current-on Immersion:* Cathode rails, mounted on insulated supports from the framework of the plating conveyor, are located above and at the back of all electrified tanks, Figure 3. Work enters the plating bath electrified. The operation produces better adhesion, and ultimately a higher quality finish.

3. *Continuous Filtration:* Over the past three years intensive studies have been conducted to improve techniques for the production and finishing of zinc die castings. It was found during the course of these studies that roughness in the deposit often starts in the copper strike.

*Continued on page 68*


# Put this "Plus" in your polishing

***ALUNDUM* B abrasive adds the time-saving product-improving "TOUCH of GOLD" to every set-up***

Here are the reasons why ALUNDUM B abrasive in your polishing set-ups will help each wheel last longer, produce more, and polish better:

***Excellent cutting action.*** This development of Norton's famous ALUNDUM abrasive cuts fast, clean and cool — ideal for polishing jobs ranging from roughing to finishing.

***Controlled uniformity.*** Grains are of uniform blocky shape. No flats, slivers or undersized grains to loaf on the job. No oversized grains to mar surfaces.

***Maximum adhesion.*** Norton's special treatment for high capillarity keeps grains from pulling out before each has done its full share of work. Whether you use cement or glue, you get this same firm-clinging action that means longer, more productive wheel life.

***Made in all grit sizes,*** from 20 through 240, to cover the widest range of polishing operations.

### *Your Norton Distributor*

is ready with prompt service on ALUNDUM B polishing abrasive. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your phone directory, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

*Making better products... to make your products better*

NORTON

**Trade Mark Reg. U. S. Pat. Off. and Foreign Countries*

G-290

***and its BEHR-MANNING division***

NORTON COMPANY. Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING DIVISION. Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

***For more information circle No. 69 on the Reader Service Card***

# USEFUL LITERATURE CATALOGS, MANUALS

*to get any of the free materials described here, circle the appropriate number on the reader service cards bound into this issue*

## PROCESSES

**Castability Chart:** 144
A guide to the standard investment casting alloys has been published by Precision Metalsmiths. Included in this single tabulation are the chemistry, mechanical and physical properties, castability, weldability, machinability, etc. for twenty six alloys, both ferrous and non-ferrous.

**Ellis Castings:** 145
The new Ellis process for precision castings is described and a number of examples of close tolerance castings given in a brochure from the Howard Foundry Co.

**Die Casting Design Data:** 146
A new engineering data book on die castings has just been published. Contained are ADCI standard specifications, tolerance tables and physical properties of die casting alloys. The book, compiled by Parker White-Metal engineers, is designed to help engineers and buyers make more effective use of die castings and to give helpful design data.

## MATERIALS AND EQUIPMENT

**Injector Burners:** 148
A new bulletin has been issued by Eclipse Fuel Engineering Co. which describes and gives sizes and operational data on series PWI Walltite Injector Burners. These are all for high pressure gas (5 to 25 lbs.)

**Automatic Controls:** 149
In a 12 page bulletin, the Automatic Temperature Control Co., Inc. describes some of the many instruments available for automatic control of process variables. These controls include temperature, press cycling, hydraulic systems, etc.

**Crucible Tongs:** 150
Increased production and decreased danger of spills are possible with properly designed tongs. Safe handling and longer crucible life are both discussed in material from the Crucible Manufacturers' Association.

**Investment Binder:** 151
Designed specifically as a binding agent for the investment casting industry a new product, Nalcoag, is described in bulletin S-743 from National Aluminate Corp.

**Effects of Shock Loading:** 152
The effect of shock loadings on castings and the role of Meehanite metal in resisting such loads are described in a seven page reprint available from the Meehanite Metal Corp.

**Carbide Prices and Styles:** 153
An 8 page booklet giving the latest prices and styles for premium grades 548 and 434 cemented carbides is available from Adamas Carbide Corp.

**Air & Hydraulic Cylinders:** 154
A new catalog on air and hydraulic cylinders has been published by Modernair Corp. The catalog gives dimension drawings, installation, operating and technical data and present prices.

**Small Die Casting Machines:** 155
In a four page brochure on machine tools and presses, Donald C. Seibert Co. described three sizes of die casting machines made by Hahn & Kolb of Stuttgart, Germany. Machine sizes are 33, 66 and 176 tons locking pressures.

**Tool Design Services:** 156
A leaflet describing a new service to industry has been published by the Euclid Industrial Design Corp. This company will undertake tool and die design in a wide variety of industries, including die casting dies and tools and molds for investment casting.

**Measuring Instruments:** 157
A new line of DC indicating and recording instruments for the accurate measurement of electrical variables, voltages, amperages, speeds, etc. is described in a new catalog sheet from the Wheelco Instruments Div. of Barber Coleman Co.

**Simplified Drafting:** 158
The American Machine & Foundry Co. has issued a booklet listing and illustrating 11 common sense rules for simplifying drafting practices. Drafting time is said to be cut from 40 to 50 percent by following these rules.

**Induction Equipment:** 159
A new price list has been issued by Ajax Electrothermic Corp. covering high frequency converters, furnaces, crucibles, furnace liners, etc.

**Recording Charts:** 160
A new 14 page bulletin has been issued by The Bristol Co. which shows some of the tests and quality control procedures which go into the manufacture of recording charts and control instruments.

**Powder Lubricant:** 161
A new material for use in powder metallurgy as a powder and die lubricant is being marketed by the Semet-Solvay Petrochemical Div., Allied Chemical & Die Corp. The lubricant, called A-C polyethylene, is fully described in data sheets from the company.

**Melting Furnaces:** 162
Designed specifically for the investment casting foundry, both melting and burn out furnaces are described in literature available from the Surface Combustion Corp. Included in the descriptive brochure are some data on the characteristics of typical investment cast alloys.

**Solid Lubricants:** 163
The third revision of the Acheson Colloids Co.'s chart on "dag" dispersions for industry is now available. Some 44 colloidal and semi-colloidal dispersions for the metalworking, foundry and allied industries are listed.

**Die Casting & Foundry Supplies** 173
An all new brochure has just been published by A C F Industries, Inc., Industrial Products Div. which lists the melting pots, goosenecks, ingot molds, etc. regularly made by them. The products are noted as specifically for the aluminum foundry trade.

## FINISHING

**Threaded Inserts:** 165

Four new bulletins have just been published by Heli-Coil Corp. that describe the many different threaded inserts and give examples of their applications. A considerable amount of design and drafting information is included.

**Spray Masks:** 166

A new 20 page brochure describing paint spray masks and much of the associated equipment for use with these masks has been issued by Wm. M. Fiore, Inc.

**Machining Titanium:** 167

How to machine titanium is the subject matter of a seven page brochure from The Mallory-Sharon Titanium Corp. Typical properties of titanium and titanium alloys are given with detailed recommendations for turning, milling, drilling, tapping, grinding, etc.

**Solution Filters:** 168

The use of filters in plating and notes on how to increase the production of plating solutions are covered in two brochures from Alsop Engineering Corp.

**Tumbling Barrels:** 169

A new two-color bulletin describes and illustrates tumbling barrels for large scale, low cost finishing operations. The barrels described employ the dry process to cut down, deburr and polish. Copies of the bulletin are available from Tumb-L-Matic, Inc.

**Bright Anodized Aluminum:** 170

How to color anodized aluminum and the colors that can be secured are given in a brochure from the Sandoz Chemical Works, Inc.

**Plastic Metal:** 171

A new plastic filler metal, an aluminum base material that is handled like putty and hardens to metal, has been announced. After hardening the material can be worked with ordinary metal working tools. No heat or pressure are needed to cure the material. Full descriptive material is available from Destiny Products Co.

**Spray-Decorating Thermoplastics:** 172

Conforming Matrix Corp. has available reprints of an article on the decoration of thermoplastics. The article gives design and molding information as well as data on finishing methods, adhesion, abrasion resistance, use of spray masks, etc.

## POWDER METALLURGY

(The following manufacturers' literature is published for the benefit of those readers who were unable to attend the Metal Powder Association meeting and displays in Philadelphia. The pieces noted were all available for distribution at the show.)

**Compacting Presses:** 175

Two bulletins available from Baldwin-Lima-Hamilton Corp. describe Model C, 20-A and 45-A presses for metal powders. Capacities range from 75 to 200 tons.

**Sintering Furnaces:** 176

Sintering furnaces and dissociated ammonia atmosphere generators designed for sintering compacts of metal powders are described in Bulletins B-101 and B-52 from the Drever Co.

**Metal Powder Press:** 177

A specification sheet describing the Dorst automatic press for powdered metals is available from Arnhold Ceramics, Inc. This is a 50 ton capacity press designed and built in Germany.

**Sintering Furnaces:** 178

A group of brochures issued by The Electric Furnace Co. describe sintering furnaces heated with oil, gas, or electricity. The advantages of each type are discussed and operational examples given.

*Continued on next page*


**Hand Work Eliminated— and Finishing Costs Cut 99+%**

BEFORE AFTER

By using Supersheen Speed Finishing a machinery manufacturer was able to reduce finishing costs 99.94%—or from $.054 to $.0003 per piece on the above part.

**WHY WAIT LONGER TO CUT YOUR DEBURRING AND FINISHING COSTS?**

Literally hundreds of case histories show almost unbelievable savings when Supersheen Speed Finishing supersedes older outdated methods. We will provide engineering and cost data from actual test runs under actual shop conditions of your parts at no cost or obligation to you. Send the coupon right away for details of this amazing Free finishing service.

ALMCO
Supersheen
SPEED FINISHING
ALBERT LEA, MINN.

**FREE** Mail coupon for this big, new 52-page catalog of money-saving finishing facts, figures, "before and after" photos. Learn the latest on equipment, compounds.

Almco Supersheen, 915 G Marshall St.
Albert Lea, Minnesota.

Please rush me your new catalog "Supersheen Speed Finishing."

Name _____

Address _____

City _____

State _____

*For more information circle No. 65 on the Reader Service Card*

THE MORE KNOW-HOW YOU PUT IN THE BARREL, THE MORE PROFIT YOU TAKE OUT

Useful facts gathered during Oakite's years of experience in barrel finishing are packed like #12 stones in this 10-page booklet covering such subjects as:

**PRECLEANING**—Good tank cleaning; Good barrel cleaning; Good rinsing saves money.

**CUTTING DOWN, DEBURRING**—Good solutions; Abrasive media, water and work ratios, etc.

**PICKLING, DESCALING, BRIGHT DIPPING**—Good solutions for steel, brass, aluminum, etc.

**BURNISHING**—Good solutions; Burnishing media, water and work ratios, etc.; How to overcome water hardness; How to keep barrels and media clean; How to prevent rusting, tarnishing and other corrosion.

**FREE** For your copy of "*May I put my head in your finishing barrel?*" just write or mail the coupon.

Technical Service Representatives in Principal Cities of U. S. and Canada

SPECIALIZED INDUSTRIAL CLEANING
**OAKITE**
MATERIALS • METHODS • SERVICE

OAKITE PRODUCTS, INC.
340 Rector St., New York 6, N. Y.

Send me a FREE copy of your booklet on Barrel Finishing.

NAME_____

COMPANY_____

ADDRESS_____

*For more information circle No. 70 on the Reader Service Card*


## Useful Literature — Cont.

**Comminuting Machines:** 179
Pulverizing machines rated from 3 to 300 HP are described in a wall-sized brochure that has been issued by The W. J. Fitzpatrick Co.

**Metal Powder Presses:** 180
Two brochures available from the Kux Machine Co. describe, in detail, their presses for the powder metallurgy industry.

**Furnaces and Gas Generators:** 181
A group of three brochures and two charts has been issued by Lindberg Engineering Co. that describe the furnaces and gas atmosphere generators made by that company.

**Combustion Control:** 182
Five descriptive brochures on the control of gas flow and combustion have been prepared by the Selas Corp. of America. Flow gauges, burners, gas pumps, etc. are covered.

**Particle Size Analysis:** 183
Super classifiers for particle size fractionization and particle size distribution analysis equipment are discussed in two brochures from The Sharples Corp.

**Alloy Steels:** 184
The Vanadium-Alloy Steel Co. has available a group of booklets describing its different alloy steels for dies and tools.

**Powdered Metal Parts:** 185
A new brochure issued by the Chicago Powdered Metal Products Co. illustrates many parts that have been made from metal powders and gives valuable design suggestions.

**Stainless Steel Powders:** 186
The properties of stainless steel powders and the preferred processing methods for them are discussed in two engineering reports that are available from Alloy Metal Powders, Inc.

**Carbonyl Iron Powder:** 187
The various grades of carbonyl iron powder and their industrial applications are fully described and their engineering properties given in a group of booklets published by the Antara Chemicals Div. of General Dyestuff Corp.

**Hydride Produced Metals & Alloys:** 188
Metal Hydrides, Inc. has prepared a series of engineering reports on the properties and uses of several products. Covered are calcium hydride, titanium, titanium hydride, zirconium, zirconium hydride, and chromium-nickel pre-alloyed powder.

**Brass Powders:** 189
The chemistry, metallurgy and application of brass powders are discussed in a brochure and in the Metal Powder Press, both issued by the New Jersey Zinc Co.

**Iron Powder:** 190
Technical data sheets on the different grades of Plast-Iron powder are available from the Plastic Metals Div. of National-U.S. Radiator Corp.

**Iron Powders:** 191
A group of very complete and highly informative data sheets giving chemical and physical properties of the powders and physical and mechanical properties of parts made from these powders are available from the Pyron Corp.

**Prealloyed Metal Powders:** 192
Four bulletins have been issued by Vanadium-Alloys Steel Co. giving the properties, processing, and uses of stainless steel powders and alloy steel (type 4650-A) powders.

## CEMENTED CARBIDES
### . . . reduce machining costs

Two new types of cemented carbides for use in the machining of steel have been announced. The new grades offer longer tool life and lower machining costs at no extra cost for the carbides.

Both new materials contain an anti-cratering material called Crystalloy by the manufacturer. This is actually a titanium carbide made by direct carburization of metallic titanium rather than by reduction and carburization of titanium oxide. The difference in oxygen content of the resultant material is believed responsible for the better performance of tungsten-titanium carbide cutting tools.

Two grades are presently available the CA-610 designed to machine steel where breakage due to impact is an important factor. The tool can be run at red heats using a low surface feed and great depth of cut with heavy feed. Grade CA-608 is designed for lighter machining and finishing where conditions that limit tool life are wear and cratering.

**Allegheny Ludlum Steel Corp.**
For more information, circle No. 208 on the Reader Service Card


*For more information circle No. 12*

**HERE IT IS!** A Low Cost-High Speed Die Casting Machine

**Over 1100 Free Cycles per Hour**

UP TO **2½lb.** SHOT CAPACITY

**Die Casters —**

**Speed Up Your Production—Increase Your Profits!**

At an investment so low that will amaze you — you can set up this compact unit in your shop and run high grade castings, up to 2½ lbs. at high speeds.

Not only is the original cost extremely low, but operating costs are so low that the machine will soon pay for itself. Actual tests operating 8 hours a day, 5 days a week, show total cost of gas and electricity of ONLY 17 CENTS PER HOUR!

All models of American Die Casting Machines are easy to operate and all contain features and workmanship of larger and much costlier machines.

Other outstanding features include — all steel welded construction — 80 ton locking pressure — automatic electric cycling at high speed — 17-¾" x 17-¾" die platens — 6½" die stroke — highest grade controls and valves mounted for easy maintenance and accessibility — a complete package with self contained unit.

Available in Air or Hydraulically operated plunger goose-neck type for zinc, tin or lead, or, cold chamber type for aluminum, brass and magnesium.

*Write for Free illustrated folder containing complete data on all models*

**AMERICAN DIE CASTING MACHINERY CO.**

1516-B Thomas St. Chicago 22, Ill. PHONE: Armitage 6-3334



**an amazing new Tapper!**

**Never Before Such Tapping Accuracy, Such Precision, Such Quality . . .**

You'll be hearing a lot about this great new LEAD SCREW tapping unit with the "finger-tip" driving action. Think of it! . . . you can now produce **gauge perfect parts — always!** There's no variation ever in the tapping action, no parts spoilage, no thread distortion and because the driving action is so gentle, operator fatigue is eliminated! Has built in features unlike anything you have ever seen, including: finger tip trigger arm travels only 5/8"; tap idles in neutral, reverses at twice forward speed; friction clutch helps prevent tap breakage; positive depth stop holds uniform depth to within .005"; hardened and ground lead screw assembly replaced in seconds for varying pitches; unique wiper oils and cleans lead screw while in operation; can be air operated; plus many others.

**Send for FREE brochure giving full details, specifications and prices.**

Exclusive "Tru-Grip" Tap Holder

**Procunier Safety Chuck Co.**
Dept. 7
14-16 S. Clinton St. Chicago 6, Illinois

*For more information circle No. 72 on the Reader Service Card*



**NATIONALLY KNOWN PRODUCTS**

**using**

**MONARCH**

**PORCELAINIZED ALUMINUM CASTINGS**

will be shown at the

**HOUSEWARES SHOW**

Atlantic City — July 11 — 16th

Have you investigated this new Monarch service available for Permanent Mold Castings

**MONARCH ALUMINUM MFG. COMPANY**
9205 DETROIT AVENUE
CLEVELAND 2, OHIO

*For more information circle No. 47 on the Reader Service Card*

*to get any of the free materials described here, circle the appropriate number on the reader service cards bound into this issue*

# PRODUCT NEWS AND DEVELOPMENTS

## HIGH TEMPERATURE REFRACTORY SUITABLE FOR FOUNDRIES

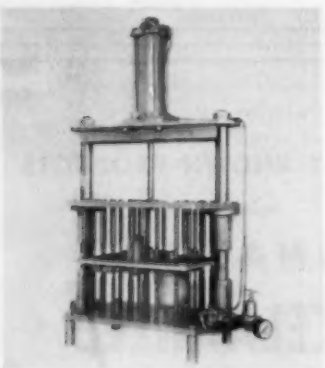
A new line of Crystalite refractories for high-temperature applications in non-ferrous foundries, steel production, kilns, glass furnaces, etc. has recently been announced.

Early field installations of the new refractory show improvement in service life as high as 250 percent in comparison with other mullite refractories.

The new material is an improved synthetic mullite refractory. It is available in the form of bricks, special shapes and ramming mixes. According to the manufacturer the synthetic mullite is stable and shows excellent refractory properties up to 3326F, has a high resistance the spalling, and good resistance to deformation at high temperatures.

**Richard C. Remmey Son Co.**
For more information, circle No. 205 on the Reader Service Card

## AIR OPERATED PRESS FOR JOINING SHELL MOLD HALVES



The ever increasing size of mold halves being made by the shell molding process has necessitated the development of large, specially designed "fusers" for joining the two parts with either an adhesive or with a plastic bond.

One of the latest machines introduced to the foundry industry is the new pin type Shalco foundry shell fuser. This new unit has been built in sizes to take mold parts up to 48" x 48" though the majority of the units are for 16" x 20" and 20" x 30" molds.

Pins with spring-loaded ends are placed in various positions to suit any particular shells to be joined in the fuser. Paste or shell mold resin is placed on one of the two hot shells, and the shells are placed in the fuser. The fuser is then closed on the mold by means of an air cylinder. Curing takes from 20 to 30 seconds.

**Shalco Engineering Corp.**
For more information, circle No. 206 on the Reader Service Card

## DRILL PRESS HEAD FITS STANDARD ENGRAVER BASES

A precision drill press head and mounting post that will fit any of the standard engraving bases made by the company has recently been offered.

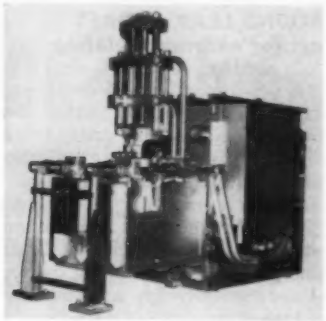
The head and mounting post is designed so that it utilizes the many self centering and other holding fixtures that are common to the engraver bases. The head is equipped with a universal motor that belt drives the precision spindle assembly through a multistage pulley.

The head is equipped with a No. 0 Jacobs chuck and the distance from the mounting post to the chuck center is 6½". A complete line of accessories is available.

**Mico Instrument Co.**
For more information, circle No. 207 on the Reader Service Card

### MAGNESIUM HOT-CHAMBER DIE CASTING MACHINE

The new model B 20 M Cast-Master die casting machine, the first machine to die cast magnesium by the hot-chamber method, has been delivered to a midwestern die casting plant.



The B 20 M consists of the company's basic die casting machine equipped with a specially designed hot-end attachment which is similar to that used on zinc die casting machines.

With this high-speed process, die casters can now produce magnesium castings at a lower cost. Other advantages include the reduction of fire hazards in the casting operation and elimination of the inconvenience of hand ladling.

By license agreement with The Dow Chemical Co., Cast-Master is now making hot-chamber magnesium die casting machines available.

**Cast-Master, Inc.**
For more information, circle No. 212 on the Reader Service Card

### BARREL FINISHER
### . . . has 8 cu. ft. capacity

In order to expand their line to include larger sizes of machines, one manufacturer of barrel finishing equipment has introduced a new 8 cu. ft. model.

The new machine represents a number of improvements over other machines of the same capacity. The drive has been redesigned so that chains or sprockets are not required. Standard equipment includes a magnetic brake motor with a jogging and reversing switch. The waterproof start-stop switch is conveniently located on the front control panel for easy access.

The barrel unit is made in from 1 to 4 compartments either lined with vinyl plastic or unlined.

**Rampe Mfg. Co.**
For more information, circle No. 210 on the Reader Service Card

### CONTOUR PROJECTOR
### . . . is precise at moderate cost

A new contour projector which permits quick, economical precision inspection right in the shop is now available.

The optical comparator is a complete checking instrument which provides accurate measurement of difficult dimensions. It is simple to operate, all measurements being taken by direct readings.

The comparator has a large work capacity, sturdy, precision construction and an optical arrangement that permits it to be used in bright light in the shop.

**Covel Mfg. Co.**
For more information, circle No. 211 on the Reader Service Card

*Continued on next page*

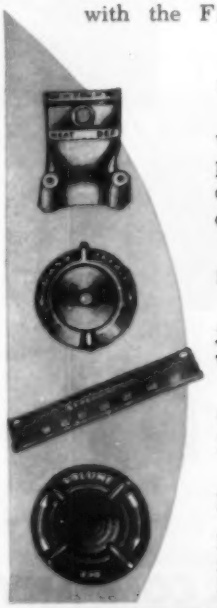
This girl wipes 80 per hour

This girl wipes 900 per hour

Entirely Air Operated

wiping the same part →

*More than 11 times faster*—and much better—with the Fin-E-Co Automatic Paint Wiper.



The operator loads, presses pedal, and the machine does a perfect job.

Wiping is done by a continuous roll towel, which may be laundered and re-used. The part is either rotated, oscillated or reciprocated as the towel wipes it. Every part comes out *clean.*

**No skill required.** The *biggest* savings are made on the *really tough* wiping jobs.

**Quick setup**— usually changed to a new job in 10 or 15 minutes. Can be located anywhere, and moved wherever needed.

**Send us a sample part,** and we'll tell you the production you can get with the Fin-E-Co Paint Wiper.

**FINISH ENGINEERING CO., INC.**
**1115 Cherry Street, Erie, Pa. Phone 5-4478**

For HIGH PRODUCTION Decorating, write for circulars on our Painting Machines • Spray Masks • Multifit Mask Clamps • Mask Washers

FINISH ENGINEERING CO., INC.

*For more information circle No. 77 on the Reader Service Card*

### TITANIUM POWDER
**. . . 99 to 99.5% purity**

Titanium powder reported to be between 99 and 99.5 percent titanium will soon be available from a new source.

The product, which will be marketed as a minus 100 mesh powder is reported to press and sinter easily due to its particle shape and spongy character.

According to the manufacturer, forming pressures of from 30 to 45 tsi are best for making the green compacts and sintering should be in an inert, preferably argon, atmosphere at 2500F. Where an inert atmosphere is not available, sintering in vacuum may be done with equal success.

The finished product shows typical corrosion resistance of massive titanium metal but lower bulk density because of some porosity in the sintered parts. Erosion resistance of parts made from powder is said to be superior to that of massive metal.

Titanium alloys with chromium and molybdenum are also available.

**United International Research, Inc.**
For more information, circle No. 209 on the Reader Service Card

### ROUND LEAD ANODES
**. . . for chromium plating baths**

A new round lead anode for use in chromium plating baths has been announced by one of the manufacturers of plating and polishing equipment and supplies.

The new anode is designed to give better current distribution over the entire anode area. It also permits faster plating, better chromium coverage and the use of higher current densities.

Made of virgin tin and lead blended into a special alloy, this anode eliminates selective corrosion caused by foreign metal inclusions. The alloy is suitable for use in all chromium solutions; other alloys are available where needed.

**Hanson-Van Winkle-Munning Co.**
For more information, circle No. 214 on the Reader Service Card

### MATCHED MACHINES & COMPOUND
**. . . give superior finishes**

By matching the finishing compounds to their own line of machines, one manufacturer reports far better results than can be secured when the material and machine are separately made by different companies.

The proper material is used to produce the necessary lubrication for chip mass and parts being processed. Other compounds have been developed to prevent tarnishing, etching and rusting of parts being processed and yet maintain cleanliness in the compartment and chip mass. In certain cases the compound also furnishes the abrasive necessary to produce the desired result.

**Roto-Finish Co.**
For more information, circle No. 215 on the Reader Service Card

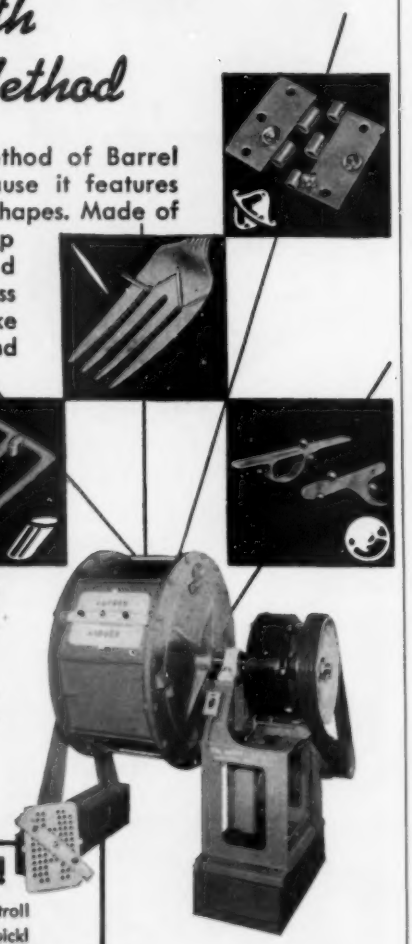
### GUSTAF LILLIEQVIST DIES

Gustaf A. Lillieqvist, 61, research director for American Steel Foundries, Chicago, known internationally for his contributions to the field of metallurgy, died suddenly of a heart attack on May 31.


*Good Barrel Finishing Costs Less with The Abbott Method*

It's a fact! The Abbott Method of Barrel Finishing reduces costs because it features long-lived Abbott Burnishing Shapes. Made of selected carbon steel — deep hardened — tempered and polished to a mirror-like glass hard finish, Abbott Shapes make efficient contact on all sizes and designs of stampings and castings. Abbott Burnishing Shapes last longer, burnish more parts and cost less in the long run. Used in Abbott Vertical Barrels they make an unbeatable barrel finishing combination!

For Proven Performance . . . use The ABBOTT METHOD.



**Improved Abbott Barrel!**
Self-contained! Precision speed control! Color dynamic! Write for details . . . quick!

ABBOTT

**THE ABBOTT BALL COMPANY**
1084 NEW BRITAIN AVE.
HARTFORD 10, CONN., U. S. A.

*For more information circle No. 63 on the Reader Service Card*

UNICHROME
Trade Mark

*News about*
COATINGS for METALS
*Metallic . . . . . Organic . . . . . Decorative . . . . . Protective*

# Chromium platers make big gains

## *More progress reported in plants using Unichrome SRHS® Chromium Plating Solutions*

### *Here's undivided responsibility for good plating results*

When Unichrome Bright Nickel was unveiled after more than 3 years of operation, the first complete, *matched* set of plating processes became available—Unichrome Copper, Bright Nickel and SRHS Chromium.

Platers can now *unify* their operation, getting three baths that work outstandingly well together; also undivided responsibility for prompt technical help. Downtime drops. Needless expense can be avoided.

Equally important are the extra opportunities for improving output and cutting production costs through the advantages of the individual processes. For example:

#### A HELP IN PRODUCTION

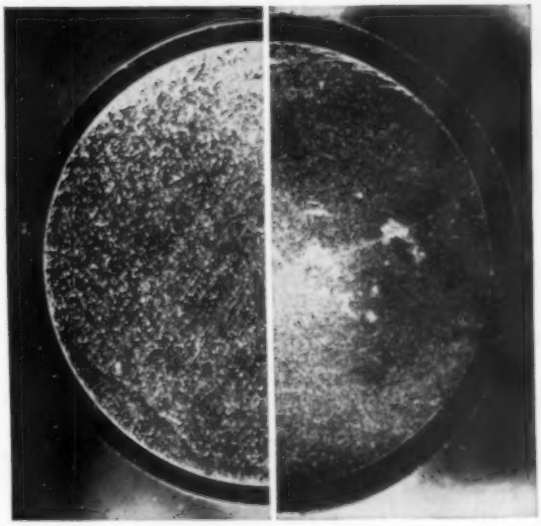
Special addition agents for Unichrome Pyrophosphate Copper enable platers to get the deposit to suit their requirements exactly. With one agent, a lustrous deposit is produced which can eliminate buffing. With another, a satin finish is produced which is ideal for buffing – permitting buffing of the free flowing copper rather than the steel or nickel.

With Unichrome Bright Nickel, deposits are obtained that are more receptive to chromium and avoid passivity problems. This stable bath also shows greater tolerance for impurities. To users this has meant reduced downtime for purification.

Send for bulletins on all three processes.

**UNITED CHROMIUM DIVISION**
**METAL & THERMIT CORPORATION**

100 East 42nd Street, New York 17, N. Y.
Waterbury 20, Conn. • Detroit 20, Mich.
Chicago 4, Ill. • Los Angeles 13, Calif.
In Canada:
United Chromium Limited, Toronto 1, Ont.



Improved cathode efficiency cuts power need, ups output, saves time. Evidence of higher cathode efficiency of SRHS: Macrograph of steel rod section at left shows 0.016" of chromium deposited in 16 hours in ordinary solution. Identical rod section at right, plated in SRHS bath under identical conditions, got 0.0225" deposit – 40% more.

The working advantages of SRHS Chromium Solutions show up in different ways. Here are a number of cases to illustrate.

#### MATERIALS CONSUMPTION CUT

In one automotive plant, the SRHS bath replaced the ordinary chromium solution in a full automatic, resulting in a decrease of salts consumption from 500 pounds down to 300 pounds daily – saving about $3000 a year on salts alone. This saving was due partly to lower dragout loss from the more dilute solution and to diminished spray loss from the more efficient SRHS solution.

#### POWER CONSUMPTION CUT

At another plant, SRHS halved power consumption. 4-rack loads of bumper guards now get coverage in SRHS with 2500 amperes, whereas this same load needed 5000 amperes in the ordinary chromium solution. Existing power supplies can gain additional work capacity with Unichrome SRHS Solutions, and platers can save on power, too.

#### PRODUCTION STEPPED UP

Because of the increased plating speed of SRHS Solutions, work took only 2½ hours in one shop, where 3½ hours had previously been needed in the ordinary solution. Taking advantage also of higher efficiency and wider bright plate range, some plants have put through 30 to 66% more work per *cycle* with SRHS.

More information on these and other benefits derived from Unichrome SRHS Solutions can be obtained from the nearest office of United Chromium. ®Trade Mark

*For more information circle No. 73 on the Reader Service Card*

NEW PANGBORN HYDRO-FINISH

For easier handling, for added efficiency . . . look to the new Pangborn Hydro-Finish! Hydro-Finish cleans and finishes molds and dies in minutes, holds fine tolerances. And now it offers many new advantages! Pangborn has done away with the pump; air jet sluriators now keep the abrasive in suspension. This means a lower investment and fewer moving parts. Optional equipment includes a loading stand that simplifies handling, washing and inhibitor application. The cabinet has been redesigned for more efficient operation. These and other advantages make the Pangborn Hydro-Finish ideal for precision cleaning and finishing!

For further details on Hydro-Finish, send for Bulletin 1403 now! Write PANGBORN CORP., 3500 Pangborn Blvd., Hagerstown, Maryland. *Manufacturers of Blast Cleaning and Dust Control Equipment.*

Pangborn

BLAST CLEANS CHEAPER

circle No. 71 on the Reader Service Card




AUTOMATIC PLATING
continued from page 59

This led to the decision to continually filter the cooper-strike bath. A 450 GPH Industrial filter is used for the job. Copper solution is filtered through one 3,000 GPH Industrial filter and nickel solution through another.

4. *Rigid Control:* Control instruments regulate all three plating baths and significant cleaning and rinsing operations. Besides automatic controls, manual controls for starting and stopping all motors in the system are available, and housed in a panel located near the load station which also contains an electric control to vary immersion time.

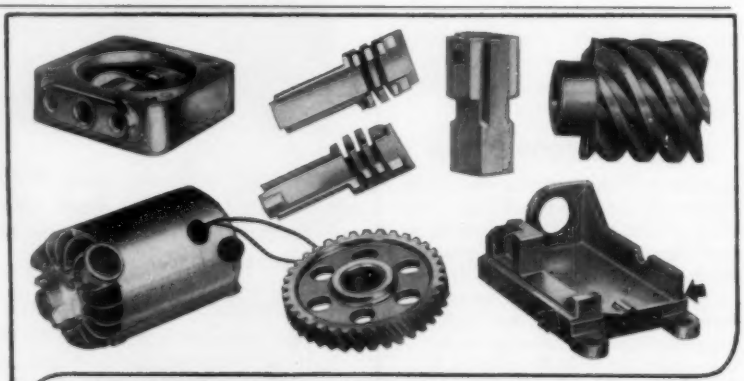
One control innovation and safety feature is a trolley stop-cord that runs around the periphery of the plating conveyor. With it, an operator can stop the conveyor from any position.

5. *High Purity Baths:* Deionized water is used for all final rinses and for making up all plating solutions. Every effort is made to maintain the purity of plating solutions and rinses. A case in point is the acid dip preceding nickel plating, which was found at first to be extremely sensitive to traces of oil on the surface. An overflow weir consequently was placed on the tank to skim oil from the bath.

6. *Close Inspection:* Each part coming off the plating machine is inspected. When a "chrome burn" does show up, the part is set aside. Rejects are few, and most blemishes can be touched up by buffing.

7. *Thorough Testing:* To test adherence, plated castings are baked for one hour at 300 F. All plated castings have to meet this test. It's quite necessary since many parts are painted in certain areas after plating and must withstand the heat of a paint curing process without blistering.

In addition, plate thickness is checked constantly. All solutions in the plating cycle are carefully controlled by the chemical laboratory, which has sole authority for making additions to the solutions. Finally, salt spray and humidity tests are also conducted on plated castings.

DIE CAST PARTS *to Your Specifications*

A pioneer in the die casting art, *Milwaukee* has long been a recognized leader in supplying *Die Castings as Specified* to all types of industry for all types of products from small precision instruments to massive heavy duty machinery. That is why you can entrust *Milwaukee* to produce die cast parts to your most exacting specifications — not only in dimensions — but in contour, weight, strength, pressure resistance, wear resistance, finish and other vital characteristics.

*We Operate under the Certified Zinc Plan of the American Die Casting Institute, Inc.*

MILWAUKEE DIE CASTING COMPANY

4146 N. HOLTON STREET • MILWAUKEE 12, WISCONSIN

Established 1909

For more information circle No. 45 on the Reader Service Card

## OPPORTUNITIES

*Rates: $20 for the first column inch, $15 for each additional inch payable in advance.*

**DESIGNER AND ESTIMATOR FOR DIE CASTING DIES** — Must be capable of estimating production rates and die costs from part prints. Also, layout and design die casting dies and trim dies. CastMaster, Inc., 2123 Hamilton Ave., Cleveland 14, Ohio.

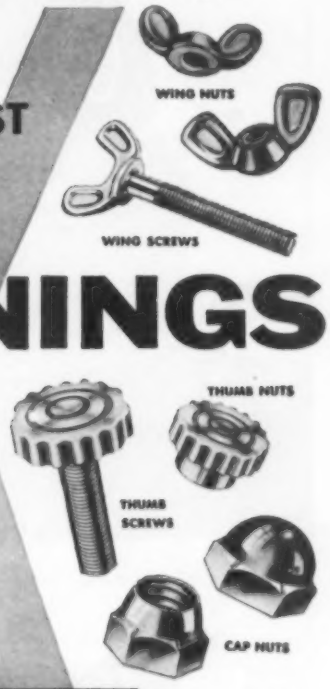
CASTABILITY
continued from page 43

of these more highly alloyed materials is more than offset by the reduction in amount of rejections.

Under wartime conditions, no such wide lattitude in requesting deviation may be permitted and the investment foundries will have to either improve their casting techniques or obtain revised specifications which will permit a better yield. It is hoped that better liason between the investment casting industry and the

*For more information circle No. 28 on the Reader Service Card*

here's what **DIE CAST**
**GRC** ZINC ALLOY THREADED
**FASTENINGS**
mean to you...




in terms of a better product
in terms of a more economical product!

**Every Quality Feature is an Economy Feature!**

- The plain bright finish does not require further surface finishing for most applications
- Closer tolerances • Cleaner threads • Greater dependability, durability • Die-cast uniformity.
- LOWER PRICED!
- NON-FERROUS • RUST-PROOF
- CORROSION-RESISTANT

Quick deliveries from stock • Specials to order

**Write Today for Samples, Prices & Bulletins**

**GRIES REPRODUCER CORP.**
157 Beechwood Ave., New Rochelle, N. Y.
Phone NEw Rochelle 3-8600

*World's Foremost Producer of Small Die Castings*

GET **MORE** PRODUCTION AND SERVICE FOR YOUR DOLLAR *with*

*Bonus Built*
**POWER PRESSES**

Rugged, dependable, time-tested Johnson presses have a reputation for adaptability. Versatility in a press earns extra income, for you can handle large jobs. All models available with key or Wichita LOW INERTIA air clutch.

Write for Specification Bulletin 1955
*Covering 20 Models 16 to 116 Tons Capacity*

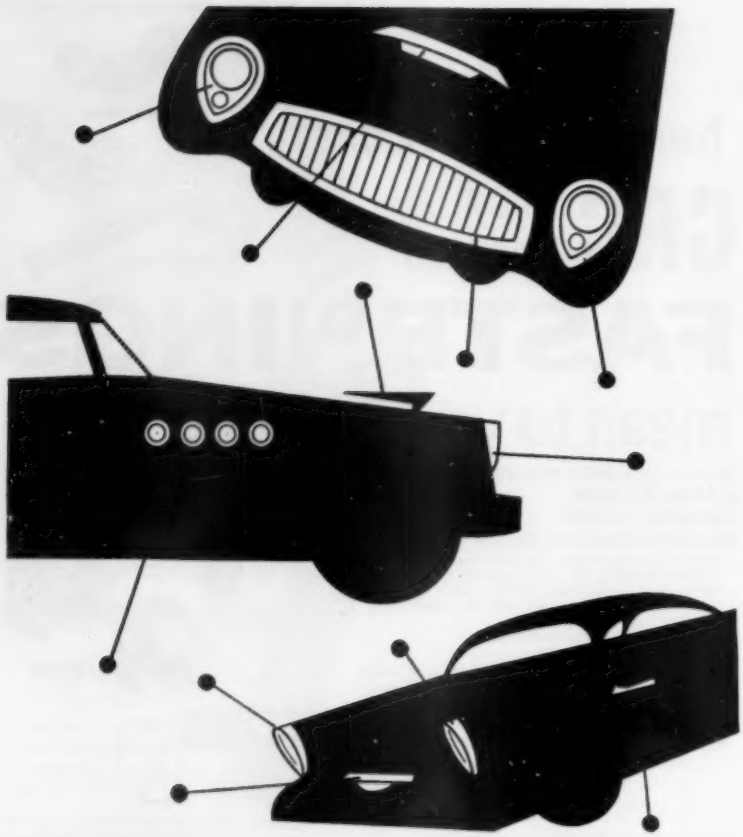
*for* **SPEED POWER ACCURACY**

*the* **HYDRA-SHEAR**

Increase your production to a new high. Shear mild steel up to 10 gauge in three lengths: 6, 8 and 10 ft. Less curl and burring. No gears or clutch.

*Johnson*
**MACHINE and PRESS CORP.**
620 W. INDIANA AVE. • ELKHART, INDIANA

*For more information circle No. 38 on the Reader Service Card*



# Better ZINC DIE CASTINGS from this engineered metal

A product of Federated research, Di-METAL is a zinc-base die-casting alloy of unusual purity. Three grades are available to assure you of the exact characteristics you want.

Produced under rigid quality control, Di-METAL is made only of metals of the highest quality. The zinc base is 99.99+% pure; only commercially pure aluminum, magnesium and electrolytic copper are added. Inspection follows every phase of the alloying process to guard against impurities. For example, in the specifications the allowable lead content is 0.007 percent; but a Federated Di-METAL ingot contains .003 percent or less, giving the die caster an extra margin of safety.

Let Federated sales engineers help you get better die castings of any metal. A suitable alloy is available or can be engineered to your precise specifications. Call any of our 13 plants or 23 sales offices across the country.

*Federated Metals*

DIVISION OF AMERICAN SMELTING AND REFINING COMPANY
120 BROADWAY, NEW YORK 5, N. Y.
*In Canada: Federated Metals Canada, Ltd., Toronto and Montreal*

*industrial first in the new overseas field* FMD

Aluminum, Anodes, Babbitts, Brass, Bronze, Die Casting Metals, Lead and Lead Products, Magnesium, Solders, Type Metals, Zinc Dust

*For more information circle No. 26 on the Reader Service Card*

Federal Bureaus, which ration and allocate these metals, through the efforts of the Investment Casting Institute, will alleviate some of the allocation problems encountered during the Korean War. Procurement of materials containing nickel, copper, cobalt, titanium, columbium, and tungsten will not pose any problems providing necessary allocations in sufficient amounts can be obtained.

## Procurement Specifications

The work being done by the Investment Casting Institute, on the establishment of material specifications designed to satisfy the manufacturing condition peculiar to the process, should eliminate much of the confusion which exists when wrought material specifications or specifications designed for sand castings or forgings are used.

The establishment of realistic chemical composition limits which will permit physical properties with better castability is a primary objective. No clear policy regarding the use of master heats is offered by any of the wrought or sand cast specifications. Requirements for tensile test bars in most specifications are incompatible with the process.

One of the greatest sources of annoyance and frustration has been the insistence of many purchasers, using a sand casting specification, that test coupons must be furnished with every melt. These test coupons are so large that the standard investment mold would have no room for the castings after the test coupons were put in.

Where no master heat system is used, the investment caster is further harrassed by the fact that he uses a crucible in which the individual melts only weigh a few pounds compared to the tonnage quantities of the sand caster, yet he is expected to test and analyze every melt.

Lack of clarity regarding radiographic inspection on the drawing of the part or in the material specification make for poor castability because of greater rejections, when this inspection develops into more critical proportions than indicated on the drawing. A recommended solution of this problem is to provide a drawing for radiographic inspection. This drawing would give the location and extent of permissible voids and inclusions and would indicate

those areas which would have to be free of these imperfections.

Magnafluxing of investment castings is normally one of little value and contributes little information on as cast surfaces. It was developed to locate surface cracks on machined surfaces and should be restricted to this use. The only possible exception may occur in the few alloys having a pronounced tendency for hot-shortness.

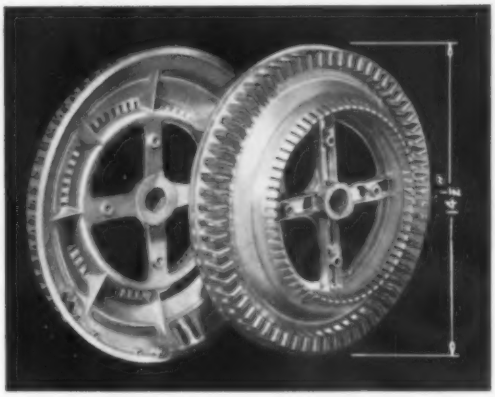
ABRASIVE BELTS
continued from page 55

**PMM** When can a vertical surfacing machine be used to best advantage?

**A.** The platen type of belt polisher is very effective in controlling external radii (using pivoted jibs on the work-table) and producing precision flats for mating and gasketing purposes. A finer grit belt should be specified where the platen type machine is used with a water or soluble oil lubricant, because the cut is sharper than that of a dry belt used with an oil or grease lubricant.

For more information circle No. 25 on the Reader Service Card

*Accurate though intricate...*



*...our aluminum die castings*

FEDERAL DIE CASTING CO.
2220 N. ELSTON AVE. CHICAGO, 14, ILL.
PHONE ARmitage 6-4803

PHOTO COURTESY OF BOEING AIRPLANE CO.

This smooth, intricately designed casting, of OPC #356 aluminum, is a component part of a jet de-icer dome assembly for the 100-ton, 600 mile-an-hour Boeing Stratojet bomber. Castings like these are delivered to Brooks & Perkins, fabricators, ready for anodizing and assembly—no machining or finishing is necessary.

Your small parts production problems may be solved just as effectively through the use of OPC premium quality castings. Our illustrated brochure shows how OPC is helping many manufacturers in a variety of industries—may we send you a copy?

OPC
OHIO PRECISION CASTINGS, INC.
P. O. Box 55, Sta. A • • • • DAYTON 3, OHIO
Plaster Mold Castings made from
BRASS • BRONZE • ALUMINUM • BERYLLIUM COPPER

For more information circle No. 51 on the Reader Service Card

FISKE'S
Since 1870

LUBRICANTS FOR FORGING AND DIE CASTING

- Reduces Smoking
- Fewer Rejects
- Better Finish
- Longer Die Life
- Less Carbon Deposit

Fiske offers two outstanding Die Lubricants for Die Casting and Forging, Upsetting, Extruding and Piercing of all metals.

**No. 514 A HOT DIE LUBRICANT** is a graphited product for use at temperatures to 2200° F. and over. It prevents hot metal from seizing dies or punches. Produces excellent finish with reduced smoking.

**No. 231 DIE CASTING COMPOUND** produces fine zinc and aluminum Die Castings. Does not fume, flash or give off offensive odors. Reduces soldering and carbon formation. Minimum gas formation results in stronger castings.

Information on each of the many Fiske Lubricating Specialties is available in bulletin form. Send for bulletins describing lubricants of interest to you.

FISKE BROTHERS REFINING CO.
Newark 5, N. J. and Toledo 5, Ohio
METAL WORKING LUBRICANTS

For more information circle No. 27 on the Reader Service Card

EVERY NUMBER LEGIBLE because of die cast print wheels ...SO

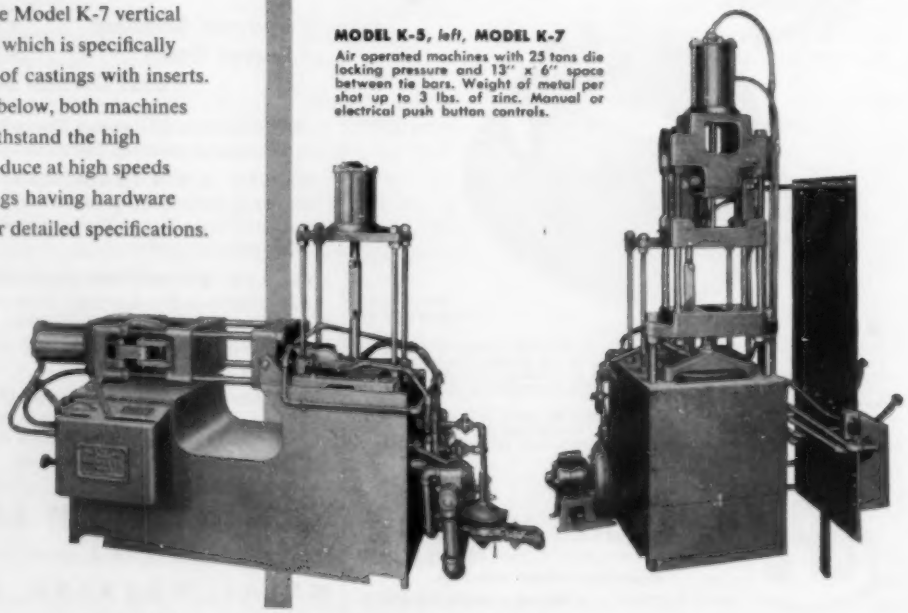
The mechanical brain of a Burroughs Corporation business machine cannot afford mistakes . . . every number must print in perfect alignment and be clearly legible. Helping Burroughs provide this unerring accuracy are radially cored die cast print wheels containing the numbers. These small print wheels, requiring machine tool precision and close tolerances, are made on KUX die casting machines. KUX machines were chosen because they can be depended on for casting parts of exacting dimensions with fine detail. Burroughs says production of print wheels has increased, "AND A BETTER PRODUCT IS OFFERED MORE ECONOMICALLY."

The wheels are cast on the Model K-7 vertical type center shot machine which is specifically designed for production of castings with inserts. Like the Model K-5, left below, both machines are massively built to withstand the high pressures required to produce at high speeds small, solid, dense castings having hardware quality finishes. Write for detailed specifications.

# Burroughs chose Kux die casting machines

## for production of these finely detailed parts

**MODEL K-5,** *left,* **MODEL K-7**
Air operated machines with 25 tons die locking pressure and 13" x 6" space between tie bars. Weight of metal per shot up to 3 lbs. of zinc. Manual or electrical push button controls.



**Kux MACHINE COMPANY**
**6725 Ridge Avenue**
**Chicago 26, Ill.**

*For more information circle No. 39 on the Reader Service Card*

# NEWS OF INDUSTRY AND ASSOCIATIONS

## KENLY ELECTED VP OF NEW JERSEY ZINC

Robert G. Kenly has been elected a vice president of The New Jersey Zinc Company. He has been vice president of The New Jersey Zinc Sales Company since 1951 and will continue to supervise the activities of that unit.

Mr. Kenly started work with the Research Department in the company's Palmerton, Penn., plant in 1919.

He is a graduate of Stevens Institute of Technology and holds a degree in mechanical engineering.

## ACME ALUMINUM FOUNDRY NAMES TWO EXECUTIVES

O. L. Earl, president, Acme Aluminum Foundry Co., Chicago, has announced the recent election by the board of directors of W. H. Osborne as executive vice president. Osborne retains the positions of secretary and treasurer. He has been associated with Acme for 16 years.

Acme directors also elected C. L. Sidinger as vice president in charge of manufacturing and engineering. Sidinger has served as works manager since 1946, following service as a lieutenant colonel in the armed forces.

## PRECISION CASTPARTS MOVES INTO NEW PLANT

One of the largest combined investment casting and shell molding foundries in the West went into production when the Precision Castparts Company of Portland, Oregon moved into its new 48,000 square foot plant at 5001 S.E. Johnson Creek Blvd. in May.

The new foundry has more than double the capacity of the company's previous operating facilities and includes complete tool and die making equipment.

The molding and casting departments has custom-built wax injection, centrifugal casting, and induction melting equipment, including a 100 KW motor generator set for handling large-production melts.

## FEDERATED METALS APPOINTED

Federated Metals Division, American Smelting and Refining Company, has been appointed exclusive agents for a line of plating chemicals manufactured by Incar, Inc., Cleveland, Ohio, it has been announced.

Incar will produce and service the chemicals, while Federated's Plating and Electrochemicals Department will arrange for distribution through leading plating supply houses. The new line of chemicals will supplement Federated's present plating anode business which includes copper, zinc, cadmium, tin, lead, including the well-known Conducta-Core, brass, silver, flattop, and other non-ferrous anodes.

## *MPA Officers & Directors For Coming Year*

H. E. Hall
Metals Disintegrating

L. W. Davis
Metal Hydrides, Inc.

R. D. Ponemon
Pyroferric Co.

E. H. Klein
New Jersey Zinc Co.

D. L. Almquist
Stackpole Carbon Co.

B. T. duPont
National-US Radiator

H. Stackpole
Stackpole Carbon Co.

W. A. Irvine
Maytag Co.

C. Johnson
Presmet Corp.

M. Boorky
Presmet Corp.

EVERY NUMBER LEGIBLE because of die cast print wheels ...SO

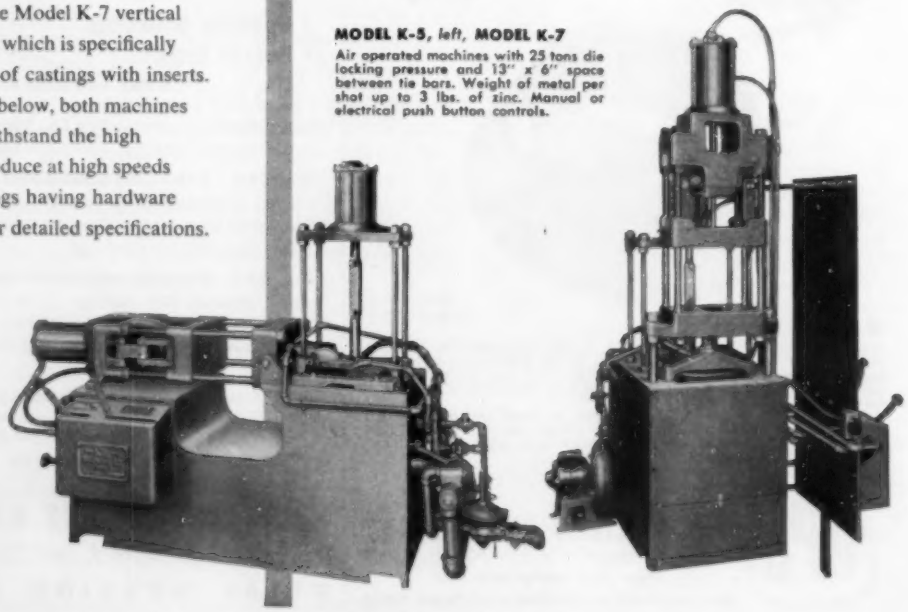
The mechanical brain of a Burroughs Corporation business machine cannot afford mistakes . . . every number must print in perfect alignment and be clearly legible. Helping Burroughs provide this unerring accuracy are radially cored die cast print wheels containing the numbers. These small print wheels, requiring machine tool precision and close tolerances, are made on KUX die casting machines. KUX machines were chosen because they can be depended on for casting parts of exacting dimensions with fine detail. Burroughs says production of print wheels has increased, "AND A BETTER PRODUCT IS OFFERED MORE ECONOMICALLY."

The wheels are cast on the Model K-7 vertical type center shot machine which is specifically designed for production of castings with inserts. Like the Model K-5, left below, both machines are massively built to withstand the high pressures required to produce at high speeds small, solid, dense castings having hardware quality finishes. Write for detailed specifications.

# Burroughs chose Kux die casting machines

## for production of these finely detailed parts

**MODEL K-5,** *left,* **MODEL K-7**
Air operated machines with 25 tons die locking pressure and 13" x 6" space between tie bars. Weight of metal per shot up to 3 lbs. of zinc. Manual or electrical push button controls.



**Kux MACHINE COMPANY**
**6725 Ridge Avenue**
**Chicago 26, Ill.**

*For more information circle No. 39 on the Reader Service Card*

# NEWS OF INDUSTRY AND ASSOCIATIONS

## KENLY ELECTED VP OF NEW JERSEY ZINC

Robert G. Kenly has been elected a vice president of The New Jersey Zinc Company. He has been vice president of The New Jersey Zinc Sales Company since 1951 and will continue to supervise the activities of that unit.

Mr. Kenly started work with the Research Department in the company's Palmerton, Penn., plant in 1919.

He is a graduate of Stevens Institute of Technology and holds a degree in mechanical engineering.

## ACME ALUMINUM FOUNDRY NAMES TWO EXECUTIVES

O. L. Earl, president, Acme Aluminum Foundry Co., Chicago, has announced the recent election by the board of directors of W. H. Osborne as executive vice president. Osborne retains the positions of secretary and treasurer. He has been associated with Acme for 16 years.

Acme directors also elected C. L. Sidinger as vice president in charge of manufacturing and engineering. Sidinger has served as works manager since 1946, following service as a lieutenant colonel in the armed forces.

## PRECISION CASTPARTS MOVES INTO NEW PLANT

One of the largest combined investment casting and shell molding foundries in the West went into production when the Precision Castparts Company of Portland, Oregon moved into its new 48,000 square foot plant at 5001 S.E. Johnson Creek Blvd. in May.

The new foundry has more than double the capacity of the company's previous operating facilities and includes complete tool and die making equipment.

The molding and casting departments has custom-built wax injection, centrifugal casting, and induction melting equipment, including a 100 KW motor generator set for handling large-production melts.

## FEDERATED METALS APPOINTED

Federated Metals Division, American Smelting and Refining Company, has been appointed exclusive agents for a line of plating chemicals manufactured by Incar, Inc., Cleveland, Ohio, it has been announced.

Incar will produce and service the chemicals, while Federated's Plating and Electrochemicals Department will arrange for distribution through leading plating supply houses. The new line of chemicals will supplement Federated's present plating anode business which includes copper, zinc, cadmium, tin, lead, including the well-known Conducta-Core, brass, silver, flattop, and other non-ferrous anodes.

## *MPA Officers & Directors For Coming Year*

H. E. Hall
Metals Disintegrating

L. W. Davis
Metal Hydrides, Inc.

R. D. Ponemon
Pyroferric Co.

E. H. Klein
New Jersey Zinc Co.

D. L. Almquist
Stackpole Carbon Co.

B. T. duPont
National-US Radiator

H. Stackpole
Stackpole Carbon Co.

W. A. Irvine
Maytag Co.

C. Johnson
Presmet Corp.

M. Boorky
Presmet Corp.

# INDEX OF ADVERTISERS


**A**

Abbott Ball Co. ..... 66
Accurate Die Casting Co. ..... 42
Acheson-Colloids Co. ..... 39
Ajax Engineering Co. ..... 12
Alcatoy, Inc. ..... 18
Alco Jewelry, Inc., R. I. Die Casting Div. ..... 43
Allied Research Products, Inc. ..... 58
Alloys & Chemicals Mfg. Co. ..... 27
Almco Div., Queen Stove Works, Inc. ..... 61
Aluminum Smelting & Refining Co. ..... Cov. II
American Die Casting Machinery Co. ..... 63
American Zinc Sales Co. ..... 11
Apex Smelting Co. ..... Cov. IV
Auto-Diesel Piston Ring Co. ..... 25

**B**

Badger Die Casting Corp. ..... 24
Belmont Smelting & Refining Works, Inc. ..... 22

**C**

Cannon-Muskegon Corp. ..... 29
Cast-Master, Inc. ..... 1
Certified Alloys Co. ..... Cov. II
Cleveland Automatic Machine Co., The ..... 17
Crucible Steel Co. of America ..... 7

**D**

Detroit Electric Furnace Div., Kuhlman Electric Co. ..... 43
Detroit Mold Engineering Co. ..... 47

**E**

Engineered Precision Casting Co. ..... 13
Enthone, Inc. ..... 10

**F**

Federal Die Casting Co. ..... 71
Federated Metals Div., American Smelting & Refining Co. ..... 70
Finish Engineering Co., Inc. ..... 65
Fiske Bros. Refining Co. ..... 71

**G**

Grav-i-Flo Corp. ..... 50
Gries Reproducer Corp. ..... 69
Groov-Pin Corp. ..... 54

**H**

Henning Bros. & Smith, Inc. ..... 25
Hoover Co., The ..... Cov. III
Hydraulic Press Mfg. Co. ..... 15

**I**

International Minerals & Metals Corp. ..... 74
International Nickel Co., Inc., The ..... 20

**J**

A. Johnson & Co., Inc. ..... 9
Johnson Machine & Press Corp. ..... 69

**K**

Kuhlman Electric Co., Detroit Electric Furnace Div. ..... 43
Kux Machine Co. ..... 72

**L**

Lindberg Engineering Co. ..... 6
Litemetal Dicast, Inc. ..... 9

**M**

Madison-Kipp Corp. ..... 5
Metals Disintegrating Co. ..... 48
Milwaukee Die Casting Co. ..... 68
Minnesota Mining & Mfg. Co. ..... 55
Monarch Aluminum Mfg. Co. ..... 63

**N**

National Molded Products, Inc. ..... 28
Nelson Metal Products, Inc. ..... 47
New England Die Casting Co. ..... 30
Norton Co., The ..... 59

**O**

Oakite Products, Inc. ..... 62
Ohio Precision Castings, Inc. ..... 71

**P**

Pangborn Corp. ..... 68
Paramount Die Casting Co. ..... 19
Parker White-Metal Co. ..... 21
Permanent Mold Die Co., Inc. ..... 4
Petrolite Corp., The ..... 6
Precision Castings Co. ..... 14
Procunier Safety Chuck Co. ..... 63

**R**

Reed-Prentice Corp. ..... 23

**S**

Schultz Die Casting Co. ..... 26
Stroh Die Moulded Castings Co. ..... 28
Stroman Furnace & Engineering Co. ..... 8

**T**

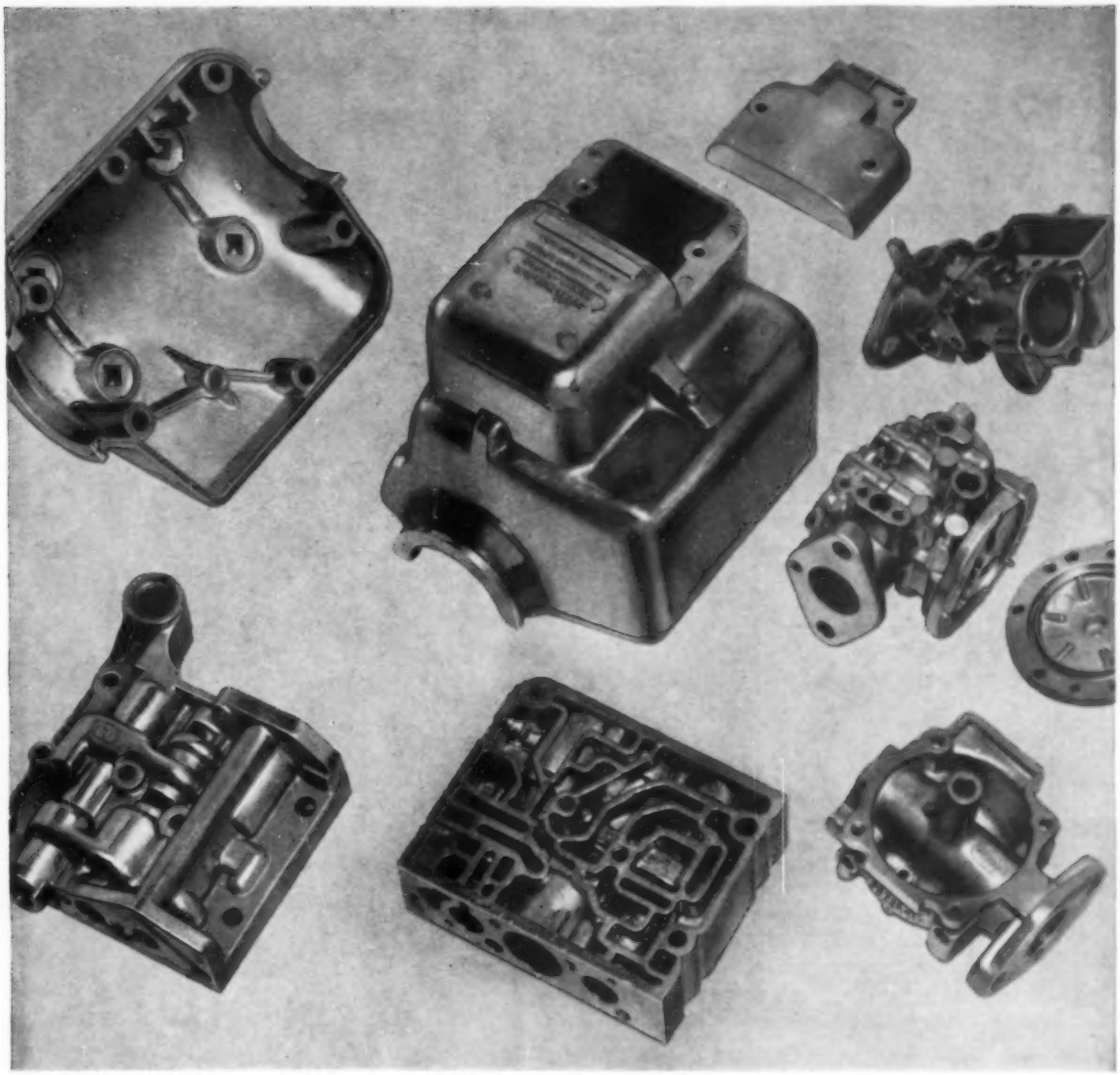
Tamms Industries, Inc. ..... 28
Thompson Products, Inc., Light Metals Div. ..... 2

**U**

United Chromium Co. ..... 67
Universal Die Casting Co. ..... 46

HUDSON BAY
SPECIAL HIGH GRADE ZINC – 99.99%
International Minerals and Metals Corp.
11 Broadway New York 4, N.Y.
One Fine Zinc For Die Casting

*For more information Circle No. 33 on the Reader Service Card*



# Can Die Castings Like These Cut Costs For You?

Every die casting you see here is cutting somebody's costs. And every casting you see here is *better* because of Hoover's years of die-casting experience.

Since 1922, veteran Hoover design engineers, X-ray and metallurgical technicians have been constantly developing better zinc and aluminum alloys, improved die designs, and more efficient production methods. The experience and techniques developed through these years produces superior castings—at greater savings.

Hoover is now producing strong, well-designed castings, like those shown here, for Tillotson Carburetors, Alliance Tenna Rotors, Detroit Transmission Division of General Motors, Ford Motor Company, Remington Rand, West Bend Aluminum, and many other manufacturers who demand precision while they watch costs.

Why not write and ask to have a Hoover Sales Engineer pay you a call? Write, too, for your copy of "Hoover Die Castings," an informative booklet of THE HOOVER COMPANY, Die Castings Division, North Canton, Ohio.

**HOOVER**

Specialists in the field of quality die casting for over 30 years

*For more information circle No. 31 on the Reader Service Card*

# APEX

# Z-39

ALUMINUM
**DIE CASTING**
ALLOY

## For High Fidelity Production . . . with Economy

• Dependable quality to exact specifications is a hallmark of Z-39 aluminum alloy, produced to high Apex standards and specially developed to give you uniform, trouble free production at lower cost. The excellent casting characteristics, mechanical properties and machinability of Z-39 meet every requirement for most jobs, produce quality castings as specified and gain you customer satisfaction, yet your savings can be material. For quality aluminum die casting with a cost conscious factor, you'll find Apex Z-39 the ideal alloy.

*Send without obligation for information covering complete specifications and properties of Apex Z-39.*

For more information circle No. 8 on the Reader Service Card

**APEX SMELTING COMPANY**

CHICAGO CLEVELAND LOS ANGELES